SERVICE

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TS-8305
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CIRCUIT DESCRIPTION

INTRODUCTION

The TS-530 is a single conversion transceiver with an intermediate frequency of 8.83 MHz.

In transmission, an SSB signal generated at 8.83 MHz is mixed with the PLL local oscillator output to produce the final transmission frequency. The circuitry is hybrid with vacuum tubes used only in the driver (12BY7A) and final-stage power amplifier (6146B's).

The PLL circuit generates a heterodyne frequency for each band and a counter reference signal from a single crystal oscillator.

The TS-530 incorporates an IF SHIFT circuit, VOX (also used for CW semi-break-in), side tone circuit, speech processor, noise blanker, XTAL calibrator, and etc.

RECEIVER CIRCUIT

The signal coming from the antenna is routed through a step-up antenna coil via an RF ATT switch and IF trap. MOS FET Q1,3SK73 amplifies this signal. Approximately 9 dB of negative feedback is applied to the RF amplifier to reduce noise and expaned dynamic range. The signal passes through buffer amplifier Q2, 2SK125 and is mixed with the PLL VCO output by a balanced mixer (Q3,Q4 : 2SK125). The DOUBLE SIDE-BAND signal is now converted to the intermediate frequency, 8.83 MHz.

Entering the IF unit, this signal is amplified by Q1(2SK125), passes through ceramic filter CF1 and the NB gating circuit, and is applied to the crystal filter whose center frequency is 8.83 MHz.

The SINGLE SIDE-BAND signal leaving the crystal filter is amplified by Q2~Q4(3SK73) and is then demodulated to an audio signal by the product detector consisting of D16~D19 (1N60 x4).

In the AF unit, the audio signal is amplified by Q2(2SC2240) passes through the AF GAIN control, and after being amplified by the power amplifier Q6 (MB3712), drives the speaker.

Item	Rating
Nominal center frequency (ƒo)	8.830 MHz
3 dB Bandwidth	ƒo±5 kHz or more, total 25 kHz or more
20dB Bandwidth	90 kHz or less
Ripple (Within 3 dB bandwidth)	1 dB or less
Spurious response	14 dB or more within ƒo±1.5 MHz
Input and output impedance	330Ω

Table 1 Ceramic filter (L72-0324-05)
SFE8.83MF (IF unit, CF1)

Item	Rating
Center frequency	8830 kHz
Center frequency deviation	Within ±150 Hz at 6 dB
Pass bandwidth	±1.2 kHz or more at 6 dB
Attenuation bandwidth	±1.5 kHz or less at 20 dB ±2.2 kHz or less at 60 dB ±3.0 kHz or less at 80 dB
Ripple	2 dB or less
Loss	6 dB or less
Guaranteed attenuation	80 dB or more within ±3 kHz to ±1 MHz
Input and output impedance	monolithic 600Ω//15pF

Table 2 Crystal (monolithic) filter (L71-0208-05)
YK-88S (IF unit, XF1)

TRANSMITTER CIRCUIT

Audio input picked up by the microphone comes to the IF unit and is amplified by Q11, 12, 15 and 16. The input circuit adapts to any microphone impedance of from 500 ohms to 50 k ohms. This amplified signal is converted into a DSB signal by the balanced modulator D27~D30 (1N60 x4), passes through buffer amplifier Q18 (2SK19) and an 8.83 MHz crystal filter, and the output appears as a SSB signal. The SSB signal is amplified by Q2 (3SK73) and is applied to the transmitter mixer in the RF unit. The transmitter mixer is a double balanced mixer consisting of Q6 and Q7 (3SK73), which mixes the SSB signal with the PLL VCO output to generate the final transmission frequency. The signal is then amplified by the driver (V1 : 12BY7A)and then by the final power amplifier (two 6146B's) and is applied to the antenna via a π-matching network.

PLL CIRCUIT

The PLL signal is synthesized from the VFO, CAR and VCO outputs. The TS-530S employs a programmable divider in the PLL to synthesize the heterodyne frequency from the standard reference oscillator frequency. This simplifies the PLL cicuit by eliminating the need for a separate HET XTAL for each band.

Frequency organization of the PLL cicuit is shown in **Fig. 1**, the circuit diagram in **Fig. 2**, and frequency organization in other circuits is summarized in **Table 4**. Please refer to **Fig. 1** when reading the following description of PLL circuit operation. MIX (3), a double balanced mixer, mixes the CAR output with the VFO output. MIX (2), which operates for the 18 MHz band and above, mixes either 10 MHz, in the 14 and 18 MHz bands, or 20 MHz, in the 21, 24.5 and 28 MHz bands, with the output of MIX (3) to generate the appropriate frequency needed for each band, as shown in **Table 4**.

CIRCUIT DESCRIPTION

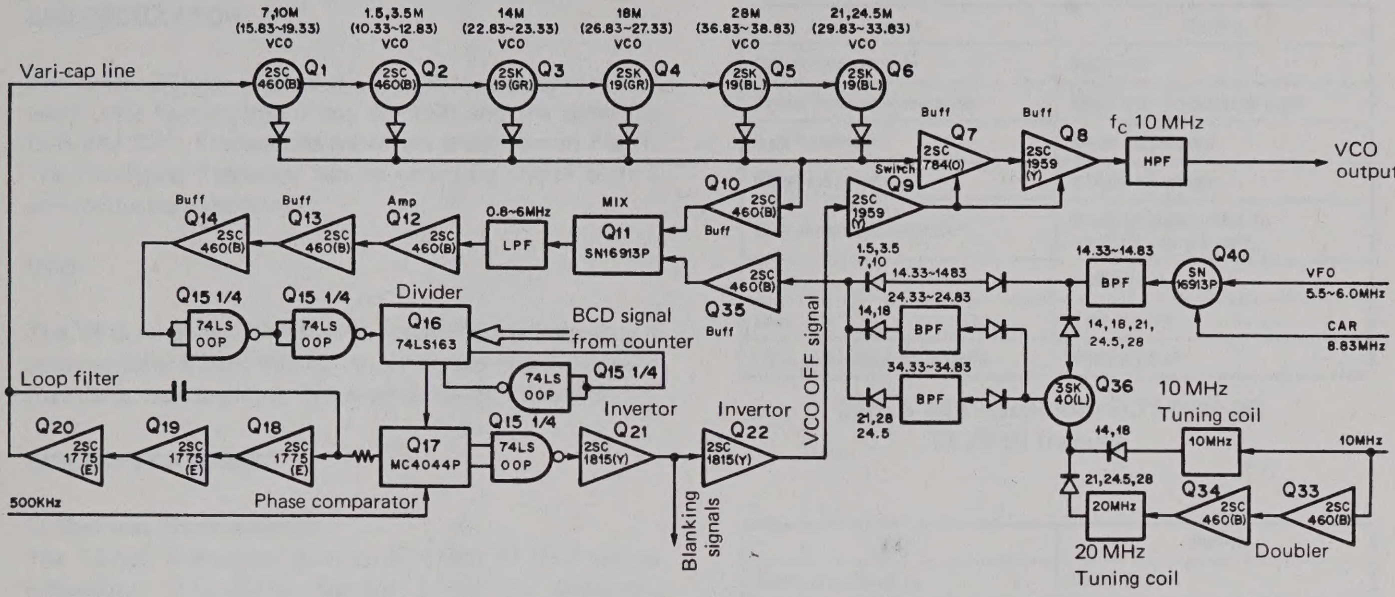


Fig. 2 TS-530 PLL circuit configuration

COUNTER

This counts the 500 kHz to 1 MHz signal which the PLL unit generates by mixing the VFO output with 5 MHz (halved from the 10 MHz reference frequency). Gate, latch, and preset pulses are generated from a 10 Hz pulse generated by dividing 1 kHz, supplied from the PLL, by 100.

BAND	100K	1 M	10M	DCBA	0.5	BAND	100K	1 M	10M	DCBA	0.5
1.5	0	1	0	1 0 0 0	H	21	5	0	2	0 1 1 1	L
3.5	0	3	0	1 1 0 0	H	24.5	0	4	2	1 1 1 0	H
7	5	6	0	1 1 0 1	L	28	5	7	2	1 0 1 1	L
10	5	9	0	0 1 1 1	L	28.5	0	8	2	1 0 1 0	H
14	5	3	1	1 1 0 1	L	29	5	8	2	1 0 0 1	L
18	5	7	1	1 0 1 1	L	29.5	0	9	2	1 0 0 0	H

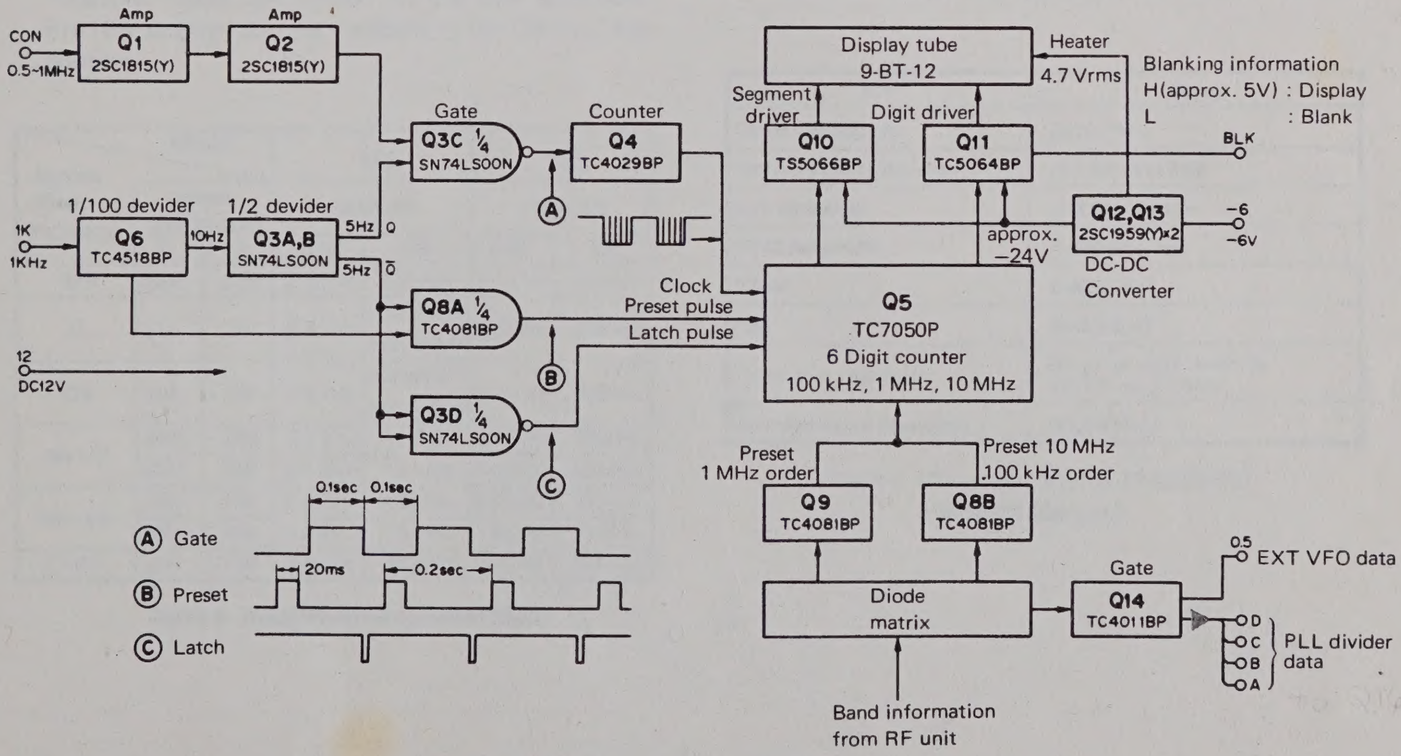


Fig. 3 Counter unit block diagram

CIRCUIT DESCRIPTION

CAR OSCILLATOR

The CAR oscillator consists of a crystal controlled oscillator which uses two crystals : one for LSB and the other for USB and CW . Frequencies generated are shown in **Fig. 1.** The oscillating frequency can be varied by the IF SHIFT control during reception.

VFO

The VFO range is 5.5~6.0 MHz. Its oscillating frequency is automatically shifted 800 Hz up during CW transmission so that the actual operating frequency is always displayed.

CIRCUIT FEATURES

1. Optional filters available

The TS-530 is equipped with an 8.83 MHz IF filter with a bandwidth of 2.4 kHz. Narrow filters are separately available.

Installation of optional filters

One or two of the YK88SN, YK88C and YK88CN optional filters can be installed in the TS-530. Jumpers A and B (for filter switching) on the IF unit must be repositioned as shown in the following table.

Install each optional filter in the specified position on the IF unit PC board. To install both a YK88C and YK88CN, install the YK88C in the SSB NARROW FILTER position and the YK88CN in the CW FILTER position.

Option filter YK-88○○	MODE Jumper destination		SSB		CW	
			NAR SW		NAR SW	
	B	A	OFF	ON	OFF	ON
SN	SSB	SSN	2.4 kHz	1.8 kHz	2.4 kHz	1.8 kHz
C	SSB	CW	2.4 kHz	Reception impossible	2.4 kHz	500 Hz
CN	SSB	CW	2.4 kHz	Reception impossible	2.4 kHz	270 Hz
SN + C	SSB	CW	2.4 kHz	1.8 kHz	2.4 kHz	500 Hz
	SSN	CW	2.4 kHz	1.8 kHz	1.8 kHz	500 Hz
SN + CN	SSB	CW	2.4 kHz	1.8 kHz	2.4 kHz	270 Hz
	SSN	CW	2.4 kHz	1.8 kHz	1.8 kHz	270 Hz
C + CN	SSN	CW	2.4 kHz	500 Hz	500 Hz	270 Hz

Table 4 Installation of optional filters

Item	Rating
Center frequency *fo*	8830 kHz
Center frequency deviation	8830 kHz ± 150 Hz at 6 dB
6 dB bandwidth	±900 Hz or more
60 dB bandwidth	±1800 Hz or less
Guaranteed attenuation	80 dB or more within *fo* ±2.5 kHz to ±1 MHz
Ripple	2 dB or less
Loss	3 dB ± 2 dB
Input and output impedance	600Ω // 15 pF

Table 5 SSB crystal filter (L71-0220-05)
YK-88SN (option)

Item	Rating
Center frequency *fo*	8830.7 kHz
Center frequency deviation	*fo* ±150Hz at 6 dB
6 dB bandwidth	±250 Hz or more
60 dB bandwidth	±900 Hz or less
Ripple	2 dB or less
Loss	6 dB ± 2 dB
Guaranteed attenuation	80 dB or more within *fo* ±2 kHz to ±1 MHz
Input and output impedance	600Ω // 15 pF

Table 6 CW crystal filter (L71-0211-05)
YK-88C (Option)

Item	Rating
Center frequency *fo*	8830.7 kHz
Center frequency deviation	*fo* ± 50 Hz at 6 dB
6 dB bandwidth	±125 Hz or more
60 dB bandwidth	± 600 Hz or less
Ripple	2 dB or less
Loss	8 dB ± 2 dB
Guaranteed attenuation	80 dB or more within *fo* ±2 kHz to ±1 MHz
Input and output impedance	600Ω // 15 pF

Table 7 CW crystal filter (L71-0221-05)
YK-88CN (Option)

CIRCUIT DESCRIPTION/AC VOLTAGE CONVERSION

3. Speech processor [Part of IF unit (X48-1310-00)]

This is an audio compression speech processor. When the processor switch is OFF, the audio signal amplified by Q11 (on the IF unit) passes through buffer amplifier Q12 (2SC1815Y) and is then applied to the MIC pot via diode switch D24 (1S1555).

When the processor switch is ON, the audio signal amplified by Q12 is applied to the AGC-type speech processor consisting of Q13 (μPC1158H2), Q14 (2SC1815Y) and D26 (1N60). The speech processor effectively increases the "talk power" of the audio signal and feeds it to MIC pot via diode switch D25 (1S1555).

When the processor is ON, the ALC time constant is shortened by turning Q30 (2SK30A) in the AF unit OFF to heighten processor effect.

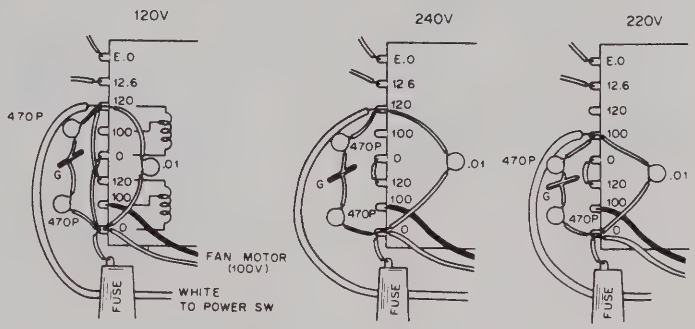
4. RIT/XIT operation

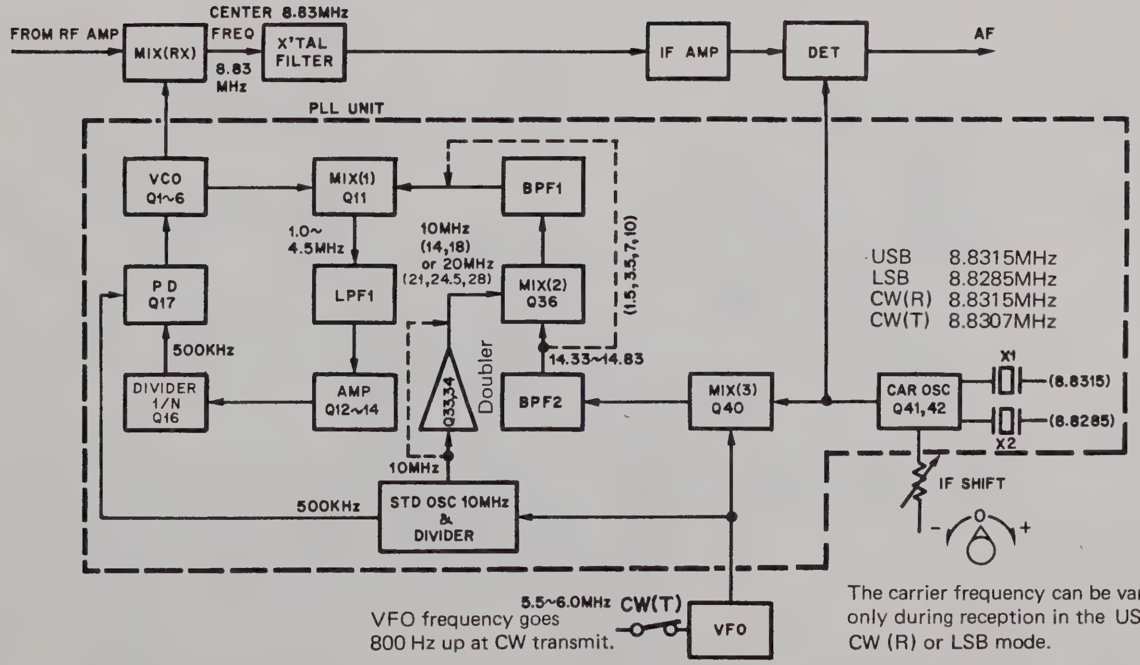
Conventional RIT function is provided by the RIT/XIT control. By also turning the XIT switch ON, the transmission frequency is shifted to the same frequency as received under RIT control.

TS-530(K) AC VOLTAGE CONVERSION

To operate the TS-530S (K) on 240V AC, the power transformer split primaries must be rewired from parallel to series connection.

1. Unplug the AC power cable.
2. Remove the bottom cover.
3. Remove the jumper wires between the two ϕ terminals and two 120 terminals on the bottom of the power transformer.
4. Connect the adjacent 120 and ϕ terminals at the middle of the transformer. This will provide 240V AC operation. For 220V AC operation, change the wires from 120 to 100 winding.
5. Change the AC fuse from 6A to 4A. Tag the power cord at the back of the radio to indicate that the transformer is strapped for 240V AC, and the power fuse should be 4A, and not 6A.
6. Replace the bottom cover and reconnect power to verify your work.





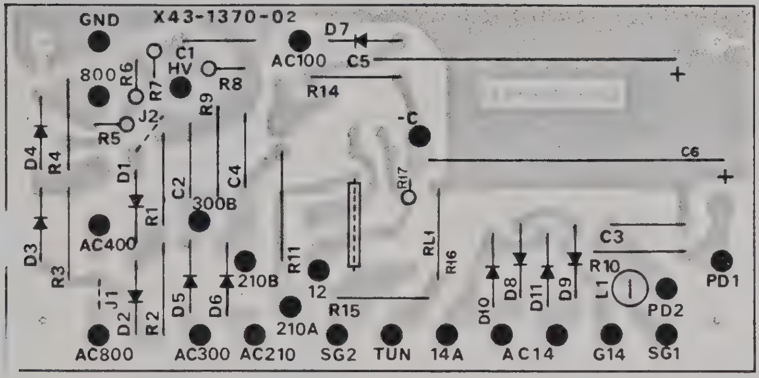
VFO frequency goes 800 Hz up at CW transmit.

The carrier frequency can be varied only during reception in the USB, CW (R) or LSB mode.

Fig. 8 IF SHIFT Block diagram

▼ RECTIFIER UNIT (X43-1370-02)

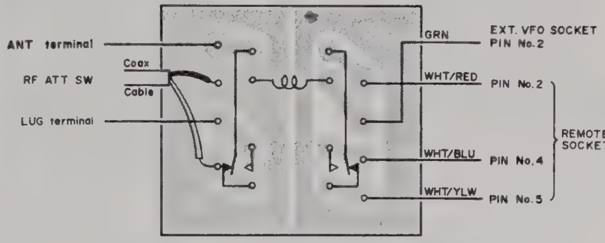
View from component side



D1~6 : V08J D7 : V06E D8~11 : V03C

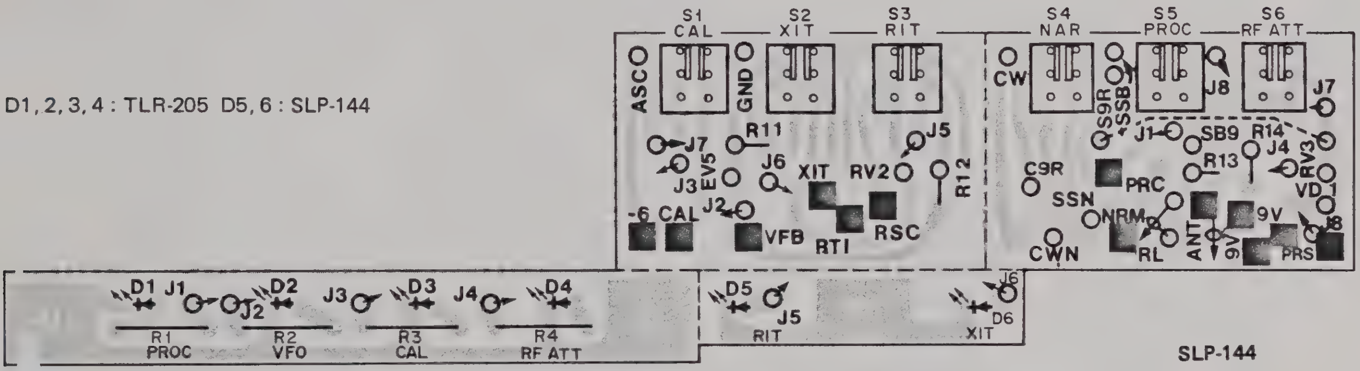
▼ ANT RELAY BOARD (J25-3015-04)

View from foil side

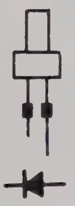


▼ SWITCH BOARD (J25-3016-03) View from component side

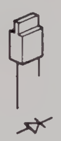
D1, 2, 3, 4 : TLR-205 D5, 6 : SLP-144



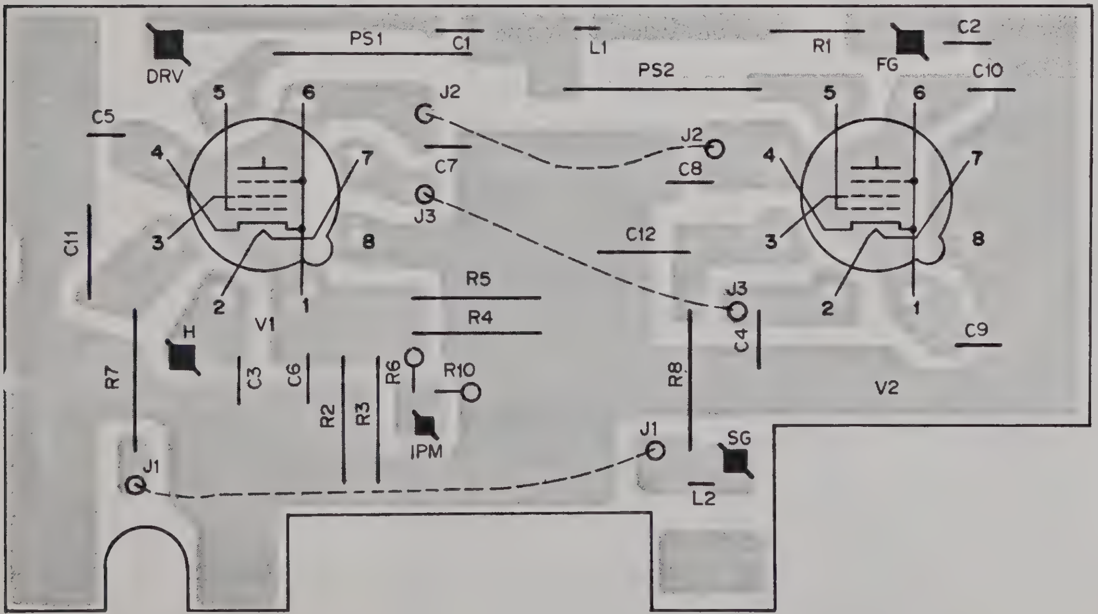
SLP-144

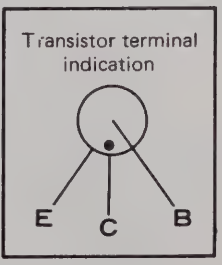


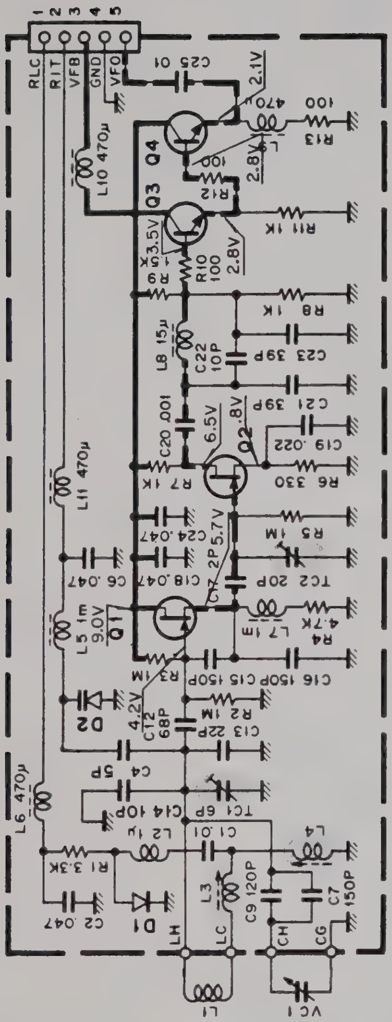
TLR-205



▼ FINAL UNIT (X56-1380-00) View from foil side





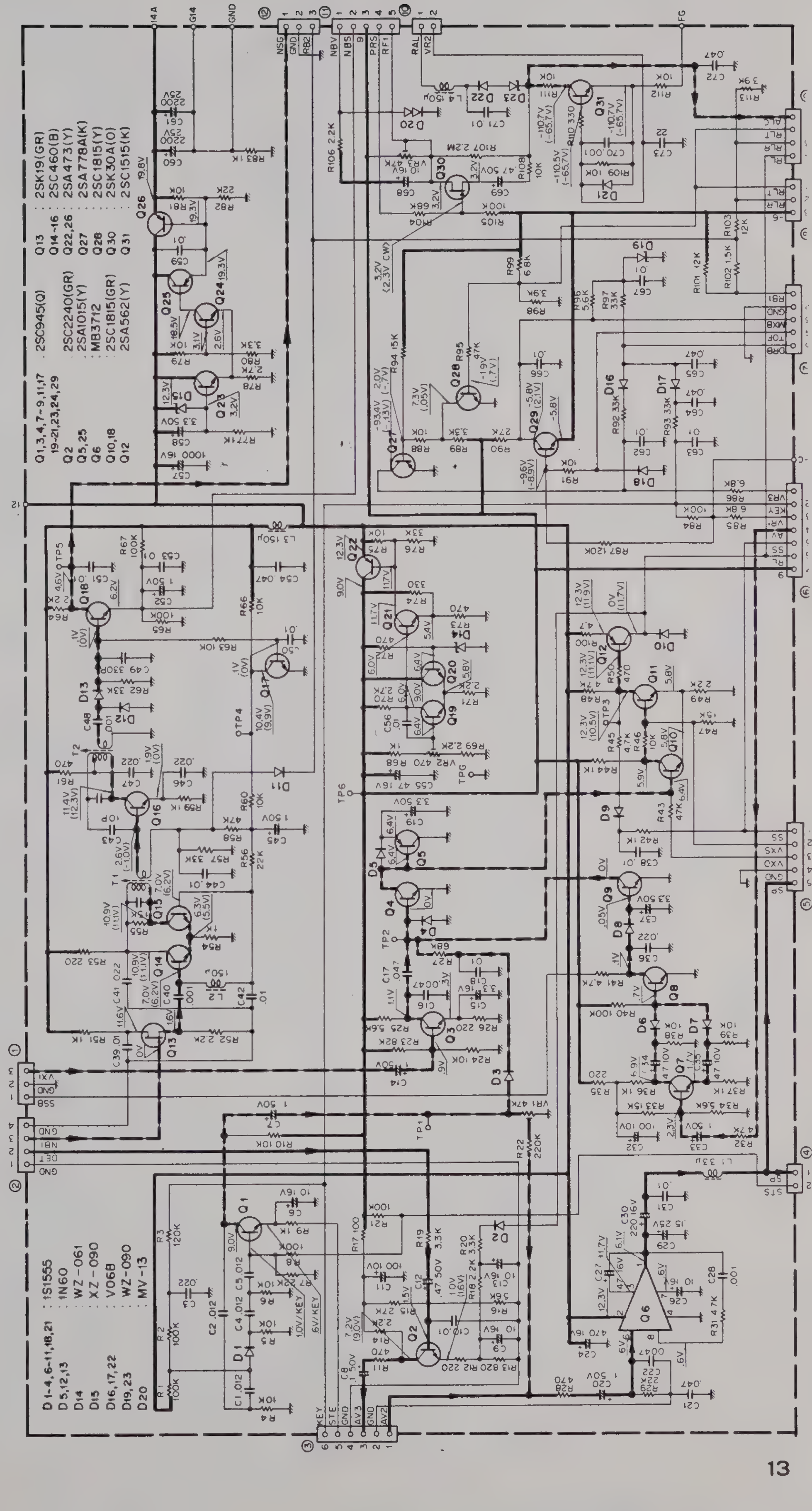


VFO UNIT (X40-1170-00) ▶

Q1, 2 : 2SK19(Y)
Q3 : 2SC460(B)
Q4 : 2SC1959(Y)

D1 : 1S2588
D2 : 1SV53A

▼ AF UNIT (X49-1150-00)

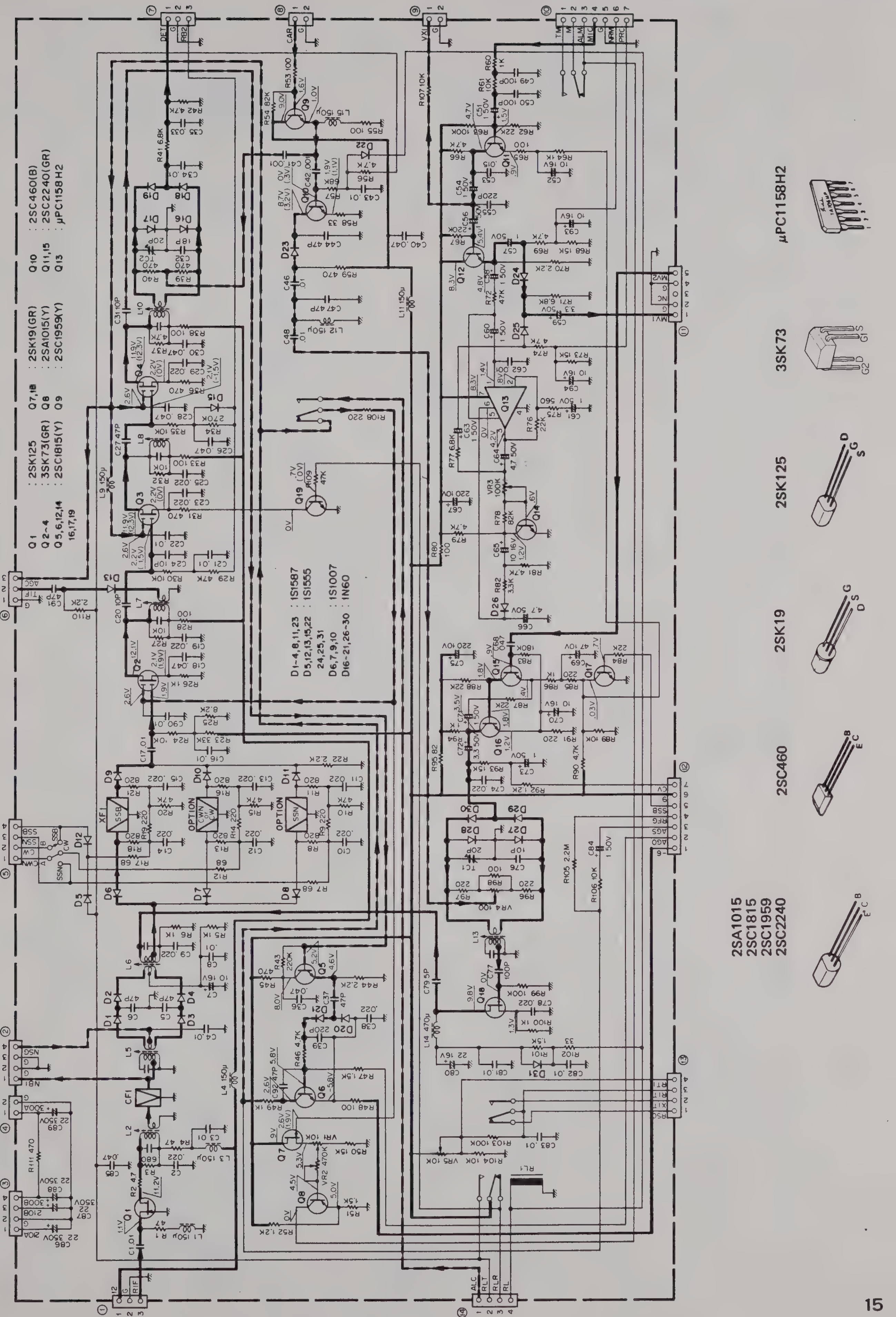


D1-4, 6-11, 18, 21 : 1S1555
D5, 12, 13 : 1N60
D14 : WZ-061
D15 : XZ-090
D16, 17, 22 : V06B
D19, 23 : WZ-090
D20 : MV-13

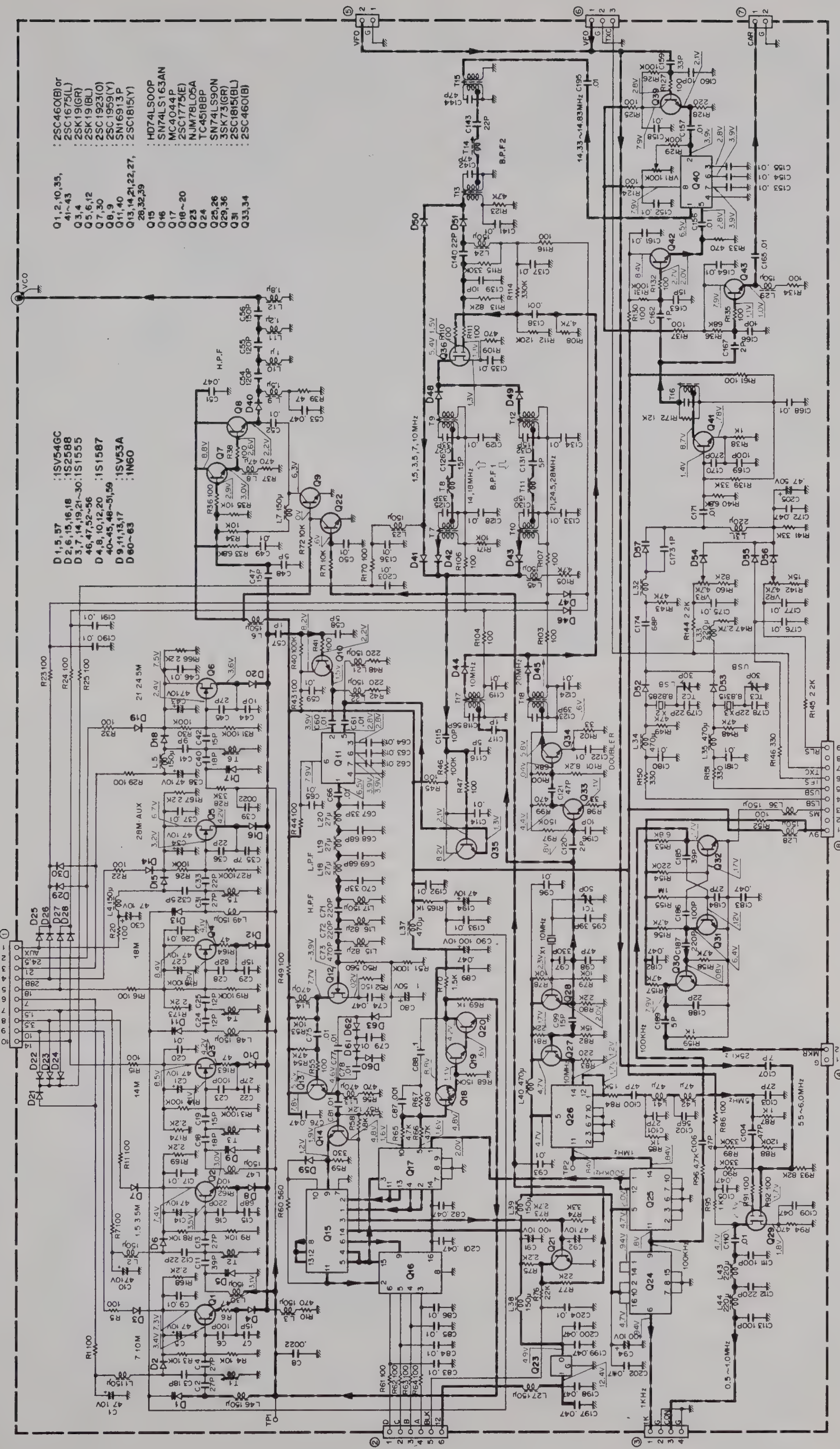
Q1, 3, 4, 7-9, 11, 17, 19-21, 23, 24, 29 : 2SC945(Q)
Q2 : 2SC2240(GR)
Q5, 25 : 2SA1015(Y)
Q6 : MB3712
Q10, 18 : 2SC1815(Y)
Q12 : 2SA562(Y)
Q13 : 2SK19(GR)
Q14-16 : 2SC460(B)
Q22, 26 : 2SA473(Y)
Q27 : 2SA778A(K)
Q28 : 2SC1815(Y)
Q30 : 2SK30A(O)
Q31 : 2SC1515(K)

CIRCUIT DIAGRAM TS-530S

▼ IF UNIT (X48-1310-00)



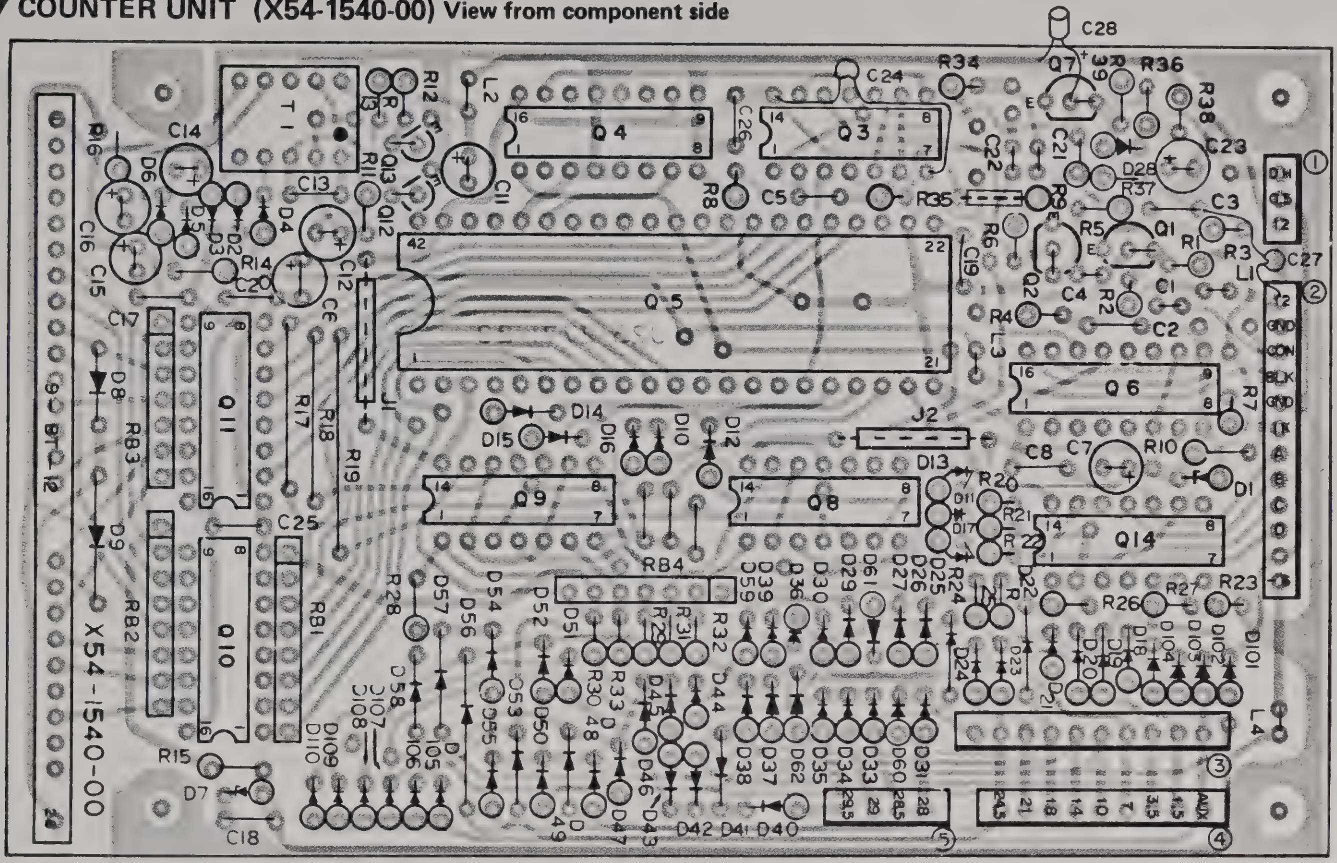
▼ PLL UNIT (X50-1680-01)

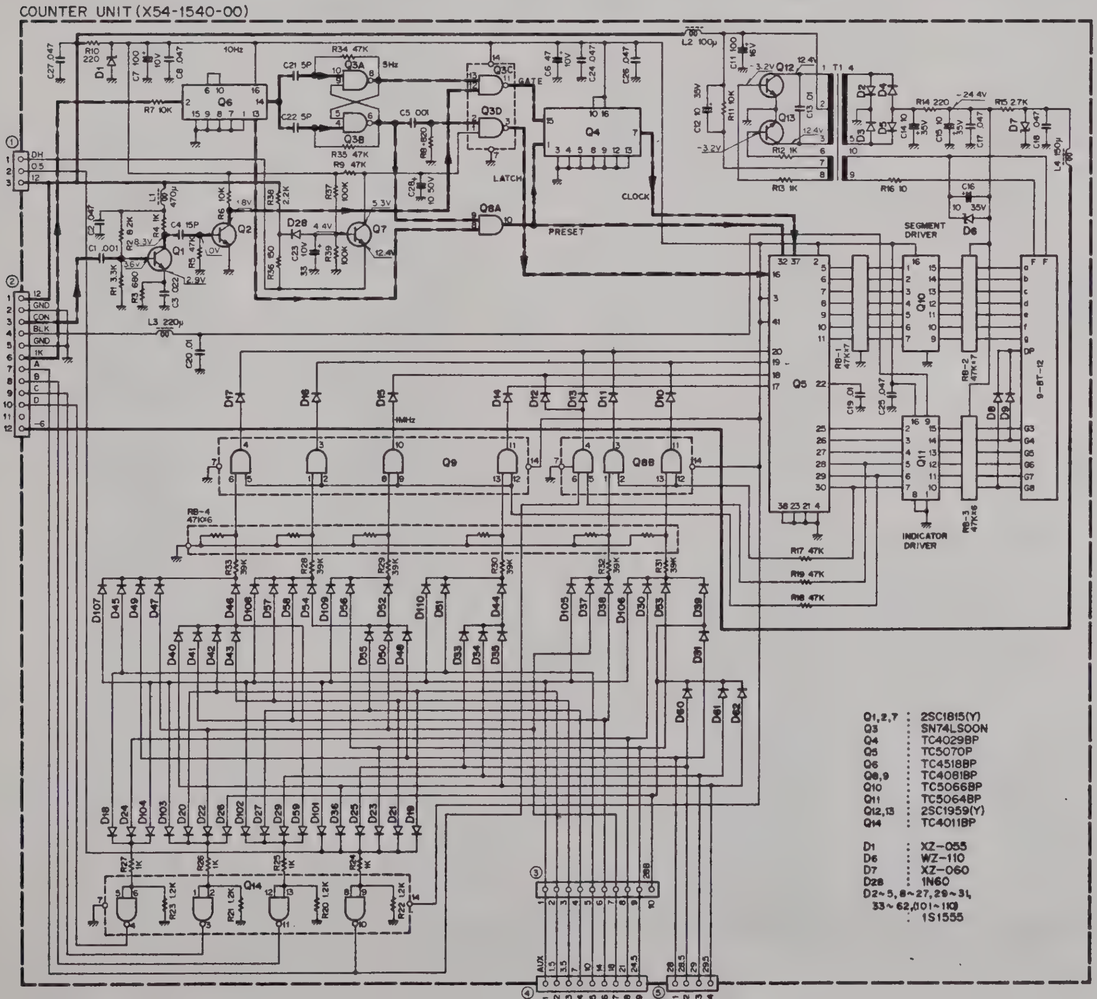


Q1,2,10,35, 41~43 : 2SC460(B) or 2SC1675(L)
Q3,4 : 2SK19(GR)
Q5,6,12 : 2SK19(BL)
Q7,30 : 2SC1923(O)
Q8,9 : 2SC1959(Y)
Q11,40 : SN16913P
Q13,14,21,22,27, 28,32,39 : 2SC1815(Y)
Q15 : HD74LS00P
Q16 : SN74LS163AN
Q17 : MC4044P
Q18~20 : 2SC1775(E)
Q23 : NJM78L05A
Q24 : TC4518BP
Q25,26 : SN74LS90N
Q29,36 : 3SK73(GR)
Q31 : 2SC1815(BL)
Q33,34 : 2SC460(B)

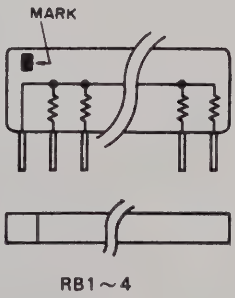
D1,5,57 : 1SV54GC
D2,6,15,16,18 : 1S2588
D3,7,14,19,21~30, 46,47,52~56 : 1S1555
D4,8,10,12,20, 40~45,48~51,59 : 1S1587
D9,11,13,17 : 1SV53A
D60~63 : 1N60

▼ COUNTER UNIT (X54-1540-00) View from component side



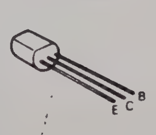


Q1,2,7	:	2SC1815(Y)
Q3	:	SN74LS00N
Q4	:	TC4029BP
Q5	:	TC5070P
Q6	:	TC4518BP
Q8,9	:	TC4081BP
Q10	:	TC5066BP
Q11	:	TC5064BP
Q12,13	:	2SC1959(Y)
Q14	:	TC4011BP
D1	:	XZ-055
D6	:	WZ-110
D7	:	XZ-060
D28	:	1N60
D2~5, 8~27, 29~31, 33~62, (101~110)	:	1S1555



RB1～4

2SC1815
2SC1959



PARTS LIST

Item	Name	Parts No.	Re-marks
TR	2SA473(Y)	V01-0473-06	
	2SA562(Y)	V01-0032-05	
	2SA778A(K)	V01-0778-16	☆
	2SA1015(Y)	V01-1015-06	
	2SC460(B)	V03-0079-05	
	2SC945(Q)	V03-0945-06	
	2SC1515(K)	V03-0450-05	
	2SC1775(E)	V03-1775-06	
	2SC1815(BL)	V03-1815-26	
	2SC1815(GR)	V03-1815-16	
	2SC1815(Y)	V03-1815-06	
	2SC1923(O)	V03-1923-06	
	2SC1959(Y)	V03-1959-06	
	2SC2240(GR)	V03-2240-06	
FET	2SK19(BL)	V09-0111-05	
	2SK19(GR)	V09-0012-05	
	2SK19(Y)	V09-0011-05	
	2SK30A(O)	V09-0056-05	
	2SK125	V09-0136-10	
	3SK73(GR)	V09-1002-46	
IC	74LS163N	V30-1037-06	
	HD74LS00P	V30-0192-16	
	HD74LS90P	V30-1083-06	
	HD74LS163P	V30-1047-06	
	MB3712	V30-1231-16	☆
	MC4044P	V30-0173-05	
	NJM78L05A	V30-1149-06	
	SN74LS00N	V30-1005-66	
	SN74LS90N	V30-1005-26	
	SN74LS163AN	V30-1154-06	
	SN16913P	V30-1048-06	
	TC4011BP	V30-0301-70	
	TC4029BP	V30-1051-06	
	TC4081BP	V30-0299-10	
	TC4518BP	V30-1039-06	
	TC5064BP	V30-1056-06	
	TC5066BP	V30-1057-06	
	TC5070P	V30-1172-06	
	μPC1158H2	V11-1177-26	
Tube	12BY7A	V40-0114-00	
	6146B	V40-0138-00	

Ref. No.	Parts No.	Description	Re-marks
TS-530S GENERAL			
	A01-0274-05	Fan case	
	A01-0778-11	Case (upper)	
	A01-0779-01	Case (lower)	
	A20-2420-03	Panel	☆
	B03-0519-04	Switch mask Panel	
	B03-0520-04	Switch mask Panel	
	B05-0708-04	Speaker grill cloth	
	B09-0003-05	Coupling Plate	
	B10-0631-04	Front glass (small)	
	B10-0639-04	Front glass (large)	☆
	B21-0501-04	Pointer Plate	
	B30-0817-15	Pilot lamp Meter 12V, 80mA	
	B31-0630-05	Meter	☆
	B42-1702-04	Adj. seal	☆
	B43-0651-04	Name plate T	☆
	B43-0653-04	Name plate K, W, X, M	☆
	B46-0058-10	Warranty card K	
	B50-2791-00	Operating manual K, W, X, M	☆
	B50-2792-00	Operating manual T	☆
	B58-0625-00	Transmit warning paper	
	B58-0631-00	Warning paper W, T, X, M	
C7	C90-0186-05	C 0.001μF 3kV	
C8	C91-0079-05	C 0.01μF 2kV	
C9	C91-0401-05	C 100pF 3kV	
C10	C91-0017-05	C 390pF 3kV	
C12	CC45SL2H101J	C 100pF 500V	
C13	CC45SL2H271J	C 270pF 500V	
C14	CC45SL2H681J	C 680pF 500V	
C15	CC45SL2H121J	C 120pF 500V	
C16	CC45SL2H821J	C 820pF 500V	
C17	CC45SL2H102J	C 0.001μF 500V	
C18, 19	C90-0300-05	C 470pF AC150V	
C20	C91-0079-05	C 0.01μF 2kV	
C22,24	C90-0327-05	E 100μF 500V	
C26	C91-0467-05	C 22pF 3kV	
C30	CC45SL1H030C	C 3pF ±0.25pF	
C31	CC45SL2H101J	C 100pF 500V	
TC1	C03-0002-05	Trimmer	
VC1	C03-0060-05	Variable cap. (A) FINAL	
VC2	C01-0084-05	Variable cap. (B) LOAD	
	D22-0402-05	Universal coupling BAND LOAD	
	D22-0405-04	Coupling PLATE	
	D22-0407-04	Shaft coupling φ6	
	D32-0051-04	Shaft stopper M3 x 10	
	D32-0075-04	Switch stopper W, T, X, M	
	D40-0613-05	Vernier mechanism	
	E04-0152-05	UHF type receptacle ANT	
	E06-0451-15	4P male socket MIC	
	E06-0751-05	7P DIN socket REMOTE	
	E06-0851-05	8P DIN socket EXT. VFO	
	E07-0403-05	4P MIC plug (accessory) W, T, X, M	
	E07-0751-05	7P DIN plug (accessory)	
	E07-0851-05	8P DIN plug EXT. VFO	
	E11-0404-05	3P phone jack KEY, PHONE	
	E11-0410-05	Phone jack EXT. SP	
	E12-0001-05	Phone plug (accessory) EXT. SP	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
RECTIFIER UNIT (X43-1370-02)			
C5,6	CE02W2C330	E 33μF 160V	
	E23-0047-04	Square terminal	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-1511-03	Ferri-inductor 150μH	
R1~4	RC05GF2H474J	Solid 470kΩ 1/2W	
R9	RC05GF2H334J	Solid 330kΩ 1/2W	
R10	RC05GF2H183J	Solid 18kΩ 1/2W	
R11	RS14AB3A471J	Metal film 470Ω 1W	
R14	RC05GF2H102J	Solid 1kΩ 1/2W	
R15	RC05GF2H563J	Solid 56kΩ 1/2W	
R16	RC05GF2H563J	Solid 56kΩ 1/2W	
	R92-0150-05	Short jumper	
RF UNIT (X44-1360-01)			
C1	CQ92M1H182K	ML 0.0018μF	
C4	CQ92M1H152K	ML 0.0015μF	
C6	CC45RH1H101J	C 100pF	
C7	CQ09S1H122J	S 0.0012μF	
C8	CC45RH1H221J	C 220pF	
C9	CC45RH1H330J	C 33pF	
C10	CC45RH1H121J	C 120pF	
C11	CC45RH1H560J	C 56pF	
C12	CC45RH1H330J	C 33pF	
C13	CC45RH1H101J	C 100pF	
C14,15	CC45RH1H330J	C 33pF	
C16	CC45SL1H561J	C 560pF	
C17	CC45RH1H221J	C 220pF	
C19	CC45RH1H150J	C 15pF	
C20	CC45RH1H330J	C 33pF	
C21	CC45RH1H121J	C 120pF	
C22	CC45RH1H560J	C 56pF	
C23	CC45RH1H330J	C 33pF	
C24	CC45RH1H101J	C 100pF	
C25	CC45RH1H330J	C 33pF	
C26	C91-0456-05	C 0.047μF	
C28	CC45SL1H561J	C 560pF	
C30	CC45RH2H330J	C 33pF 500V	
C31	CC45RH2H121J	C 120pF 500V	
C32	CC45RH2H181J	C 180pF 500V	
C33	CC45RH2H470J	C 47pF 500V	
C34	CC45RH2H270J	C 27pF 500V	
C35	CC45RH2H101J	C 100pF 500V	
C36	CC45RH2H390J	C 39pF 500V	
C37	CC45RH2H180J	C 18pF 500V	
C38	CC45SL2H100D	C 10pF ±0.5pF 500V	
C40	CC45SL2H561JTD	C 560pF 500V	
C41	CC45RH1H150J	C 15pF	
C42	CC45SL1H101J	C 100pF	
C45,46	C91-0456-05	C 0.047μF	
C49	CC45SL1H050C	C 5pF ±0.25pF	
C50	CC45SL1H220J	C 22pF	
C55,57,58	C91-0456-05	C 0.047μF	
C61	CC45SL1H470J	C 47pF	
C62	CC45RH1H150J	C 15pF	
C63	CC45SL1H151J	C 150pF	
C66,67	C91-0456-05	C 0.047μF	
C69	CC45SL2H151J	C 150pF 500V	
C78	C91-0456-05	C 0.047μF	
VC1~3	C01-0127-15	Variable capacitor	
	D13-0404-04	Sprocket large	
	D13-0405-04	Sprocket small	
	D16-0403-04	Chain ass'y	
	E04-0154-05	Coax connector	
	E10-1902-05	9P tube socket	
	E23-0047-04	Square terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0374-05	Mini connect wafer 3P L type	
	E40-0474-05	Mini connect wafer 4P L type	
	E40-0973-05	Mini connect wafer 9P	
	F11-0249-05	Tube shield	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-2792-02	Ferri-inductor 2.7μH	
L2	L40-4791-02	Ferri-inductor 4.7μH	
L3	L34-0559-05	Trap coil	
L4	L34-0558-05	Trap coil	
L5	L34-0930-05	Tuning coil 3.5MHz	
L6	L34-0931-05	Tuning coil 7MHz	
L7	L34-0932-05	Tuning coil 10MHz	
L8	L34-0933-05	Tuning coil 14MHz	
L9	L34-0934-05	Tuning coil 18MHz	
L10	L34-0990-05	Tuning coil 21MHz	
L11	L34-0935-05	Tuning coil 24.5MHz	
L12	L34-0995-05	Tuning coil 28MHz	
L13	L34-0936-05	Tuning coil MIX 1.5MHz	
L14	L34-0930-05	Tuning coil 3.5MHz	
L15	L34-0931-05	Tuning coil 7MHz	
L16	L34-0932-05	Tuning coil 10MHz	
L17	L34-0933-05	Tuning coil 14MHz	
L18	L34-0934-05	Tuning coil 18MHz	
L19	L34-0990-05	Tuning coil 21MHz	
L20	L34-0935-05	Tuning coil 24.5MHz	
L21	L34-0995-05	Tuning coil 28MHz	
L23	L34-0552-15	Tuning coil 1.5MHz	
L24	L34-0553-15	Tuning coil 3.5MHz	
L25	L34-0554-05	Tuning coil 7MHz	
L26	L34-0937-05	Tuning coil 10MHz	
L27	L34-0555-05	Tuning coil 14MHz	
L28	L34-0938-05	Tuning coil 18MHz	
L29	L34-0556-05	Tuning coil 21MHz	
L30	L34-0939-05	Tuning coil 24.5MHz	
L31	L34-0557-05	Tuning coil 28MHz	
L32~34	L40-4711-03	Ferri-inductor 470μH	
L35	L40-1511-03	Ferri-inductor 150μH	
L36	L40-4711-03	Ferri-inductor 470μH	
L37	L40-1511-03	Ferri-inductor 150μH	
L39	L33-0074-05	Heater choke 0.3μH	
L40	L40-4782-02	Ferri-inductor 0.47μH	
L41	L34-2004-05	Tuning coil ANT 1.5MHz	
L42	L40-4711-03	Ferri-inductor 470μH	
L43	L40-1511-03	Ferri-inductor 150μH	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
C13	CE04W1C100M	E 10μF 16V	
C14	CE04W1H010M	E 1μF 50V	
C15	CE04W1C3R3M	E 3.3μF 16V	
C16	CQ92M1H472K	ML 0.0047μF	
C17	CQ92M1H473K	ML 0.047μF	
C19	CE04W1H3R3M	E 3.3μF 50V	
C20	CE04W1H010M	E 1μF 50V	
C21	C91-0456-05	C 0.047μF 25V	
C22	CQ92M1H223K	ML 0.022μF	
C24	CE04W1C471M	E 470μF 16V	
C26	CE04W1C100M	E 10μF 16V	
C27	CE04W1C470M	E 47μF 16V	
C29	C90-0834-05	Cap. 0.15μF 25V	☆
C30	CE04W1C221M	E 220μF 16V	
C32	CE04W1A101M	E 100μF 10V	
C33	CE04W1H010M	E 1μF 50V	
C34,35	CE04W1A470M	E 47μF 10V	
C37	CE04W1H3R3M	E 3.3μF 50V	
C43	CC45SL1H050C	C 5pF ±0.25pF	
C45,52	CE04W1H010M	E 1μF 50V	
C55	CE04W1C470M	E 47μF 16V	
C57	CE04W1C102M	E 0.001μF 16V	
C58	CE04W1H3R3M	E 3.3μF 50V	
C60,61	C90-0807-05	E 2200μF 25V	
C64,65	CQ93M2A473K	ML 0.047μF 100V	
C68	CE04W1C100M	E 10μF 16V	
C69	CE04W1HR47M	E 0.47μF 50V	
C73	CQ93M2A224M	ML 0.22μF 100V	
	E23-0047-04	Square terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0573-05	Mini connect wafer 5P	
	E40-0673-05	Mini connect wafer 6P	
	E40-0773-05	Mini connect wafer 7P	
	F20-0516-05	Insulating sheet	
	F29-0014-05	Shoulder washer	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-3392-02	Ferri-inductor 3.3μH	
L2~4	L40-1511-03	Ferri-inductor 150μH	
T1	L34-0535-05	Tuning coil red NB	
T2	L34-0536-05	Tuning coil blue NB	
VR1	R12-3411-05	Trim. pot 47kΩ	
VR2	R12-0413-05	Trim. pot 470Ω	
VR3	R12-3411-05	Trim. pot 47kΩ	
	R92-0150-05	Short jumper	

PLL UNIT (X50-1680-01)

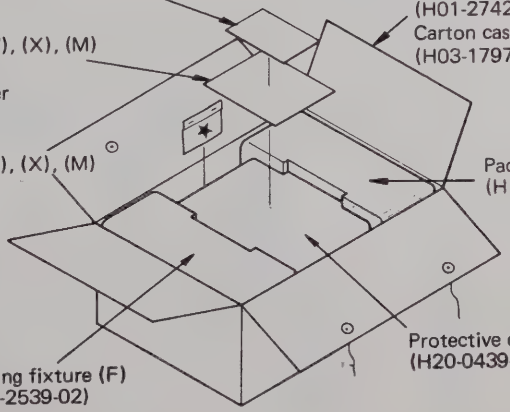
Ref. No.	Parts No.	Description	Re-marks
C1	CE04W1A470M	E 47μF 10V	
C2	CC45TH1H270J	C 27pF	
C3	CC45TH1H180J	C 18pF	
C4	CC45TH1H270J	C 27pF	
C5	CE04W1A470M	E 47μF 10V	
C6	CC45UJ1H101J	C 100pF	
C7	CC45UJ1H150J	C 15pF	
C10	CE04W1A470M	E 47μF 10V	
C11	CC45TH1H390J	C 39pF	
C12	CC45TH1H220J	C 22pF	
C13	CC45TH1H270J	C 27pF	
C14	CE04W1A470M	E 47μF 10V	
C15	CC45SH1H680J	C 68pF	
C16	CC45RH1H221J	C 220pF	
C18	CC45TH1H180J	C 18pF	
C19	CC45TH1H150J	C 15pF	
C21	CE04W1A470M	E 47μF 10V	
C22	CC45UJ1H270J	C 27pF	
C23	CC45TH1H101J	C 100pF	
C24,25	CC45UJ1H120J	C 12pF	
C27	CE04W1A470M	E 47μF 10V	
C28	CC45UJ1H820J	C 82pF	
C29	CC45UJ1H150J	C 15pF	
C30	CE04W1A470M	E 47μF 10V	
C31	CC45TH1H270J	C 27pF	
C32	CC45UJ1H050C	C 5pF ±0.25pF	
C33	CC45UJ1H220J	C 22pF	
C34	CE04W1A470M	E 47μF 10V	
C35	CC45UJ1H070D	C 7pF ±0.5pF	
C36	CC45UJ1H220J	C 22pF	
C38	CE04W1A470M	E 47μF 10V	
C40	CC45UJ1H180J	C 18pF	
C41	CC45UJ1H090D	C 9pF ±0.5pF	
C42	CC45TH1H150J	C 15pF	
C43	CE04W1A470M	E 47μF 10V	
C44	CC45UJ1H100D	C 10pF ±0.5pF	
C45	CC45UJ1H270J	C 27pF	
C47	CC45TH1H150J	C 15pF	
C48	CC45TH1H050C	C 5pF ±0.25pF	
C51,53	C91-0456-05	C 0.047μF	
C54,55	CC45SL1H121J	C 120pF	
C56	CC45SL1H151J	C 150pF	
C57	CC45CH1H010C	C 1pF ±0.25pF	
C58	CC45SL1H050C	C 5pF ±0.25pF	
C67	CC45SL1H330J	C 33pF	
C68,69	CC45SL1H680J	C 68pF	
C70	CC45SL1H330J	C 33pF	
C71,72	CC45SL1H221J	C 220pF	
C74,76	C91-0456-05	C 0.047μF	
C80	CE04W1H010M	E 1μF 50V	
C82	C91-0456-05	C 0.047μF	
C87	CQ92M1H102K	ML 0.001μF	
C88	CQ92M1H104K	ML 0.1μF	
C89	C91-0456-05	C 0.047μF	
C90,91	CE04W1A101M	E 100μF 10V	
C92	CE04W1A470M	E 47μF 10V	
C94	CE04W1A101M	E 100μF 10V	
C95	CC45SL1H390J	C 39pF	
C97	CC45SL1H331J	C 330pF	
C98	CC45SL1H470J	C 47pF	
C99	CC45SL1H150J	C 15pF	
C100	CC45SL1H470J	C 47pF	
C101	CC45SL1H270J	C 27pF	
C102	CC45SL1H560J	C 56pF	
C103	CC45SL1H270J	C 27pF	
C104	CC45SL1H470J	C 47pF	
C105	C91-0456-05	C 0.047μF	
C106	CC45SL1H470J	C 47pF	
C107	CC45SL1H070D	C 7pF ±0.5pF	
C109	C91-0456-05	C 0.047μF	
C111	CC45SL1H101J	C 100pF	
C112	CC45SL1H221J	C 220pF	

PARTS LIST/PACKING

Ref. No.	Parts No.	Description	Re-marks
T1	L19-0323-05	OSC trans	☆
R10	RC05GF2H221J	Solid 220Ω 1/2W	
RB1,2	R90-0521-05	Resistor block 47kΩ X7	
RB3,4	R90-0522-05	Resistor block 47kΩ X6	
	R92-0150-05	Short jumper	
FINAL UNIT (X56-1380-00)			
C1	CC45SL2H101J	C 100pF 500V	
	E01-0002-05	8P (octal) socket	
	E23-0046-04	Square terminal	
L1	L40-1511-03	Ferri-inductor 150µH	
L2	L40-4711-03	Ferri-inductor 470µH	
PS1,2	L33-0010-05	Parastic suppressor GRID	
R2~5	RC05GF2H200J	Solid 20Ω 1/2W	
R7	RC05GF2H101J	Solid 100Ω 1/2W	
R8	RC05GF2H101J	Solid 100Ω 1/2W	
VFO ASS'Y UNIT (X60-1150-01)			
	B07-0630-05	Dial escutcheon	
	B10-0632-04	Escutcheon glass	
	B20-0816-04	Dial scale (B)	
	B20-0818-04	Dial scale (A)	☆
	B30-0819-05	Pilot lamp	
	B42-1645-04	Seal Bottom	
	B42-1671-04	Seal Top	
	G01-0804-04	Coil spring	
	K21-0753-04	Main knob	
	X40-1170-00	VFO unit	

Ref. No.	Parts No.	Description	Re-marks
VFO UNIT (X40-1170-00)			
C2	C91-0456-05	C 0.047µF 25V	
C4	CC45CG1H050C	C 5pF ±0.25pF	
C6	C91-0456-05	C 0.047µF 25V	
C7	CC45LG1H151J	C 150pF	
C9	CC45LG1H121J	C 120pF	
C12	CC45LG1H680J	C 68pF	
C13	CC45CG1H220J	C 22pF	
C14	CC45PG1H100D	C 10pF ±0.5pF	
C15,16	CC45LG1H151J	C 150pF	
C17	CC45CH1H020C	C 2pF ±0.25pF	
C18	C91-0456-05	C 0.047µF 25V	
C21	CC45SL1H390J	C 39pF	
C22	CC45CH1H100D	C 10pF ±0.5pF	
C23	CC45SL1H390J	C 39pF	
C24	C91-0456-05	C 0.047µF 25V	
TC1	C05-0009-15	Ceramic trimmer 6pF	
TC2	C05-0013-15	Ceramic trimmer 20pF	
VC1	C02-0019-05	Variable cap.	
	D40-0614-05	Dial mechanism ass'y	
	E40-0574-05	Mini connect wafer 5P	
	F29-0014-05	Insulating washer	
L1	L32-0628-05	OSC coil	
L2	L33-0025-05	Choke coil 1µH	
L3	L32-0629-05	OSC coil	
L4	L32-0609-05	OSC coil	
L5	L40-1021-03	Ferri-inductor 1mH	
L6	L40-4711-03	Ferri-inductor 470µH	
L7	L40-1021-03	Ferri-inductor 1mH	
L8	L40-1501-03	Ferri-inductor 15µH	
L9~11	L40-4711-03	Ferri-inductor 470µH	
	R92-0150-05	Short jumper	

PACKING



Warranty card
(B46-0058-10) (K)

Operating manual
(B50-2791-00) (K), (W), (X), (M)
(B50-2792-00) (T)
Transmit warning paper
(B58-0625-00)
Warning paper
(B58-0631-00) (W), (T), (X), (M)

Carton case (inside)
(H01-2741-04) (K), (W), (X), (M)
(H01-2742-04) (T)
Carton case (outside)
(H03-1797-04)

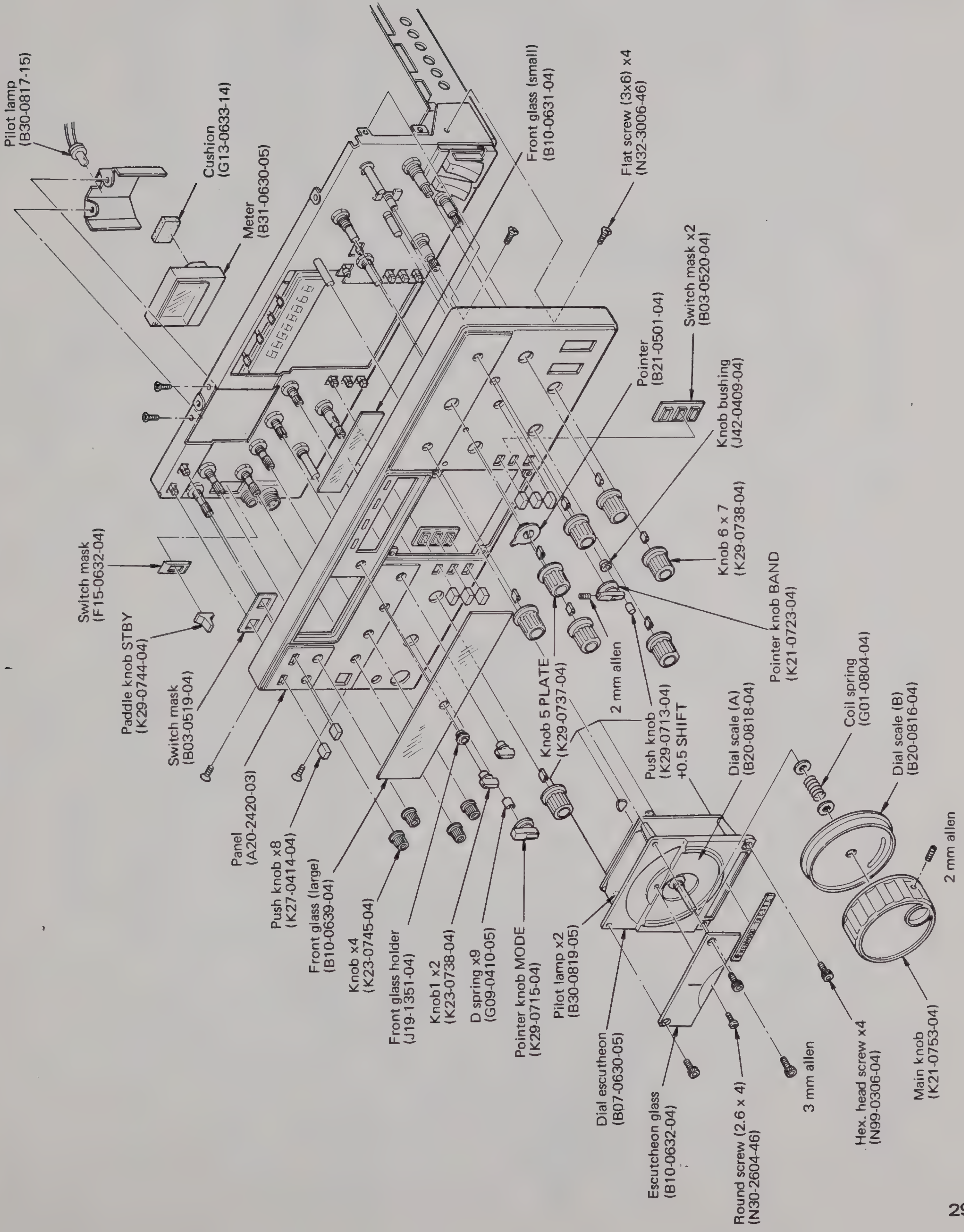
Packing fixture (R)
(H10-2540-02)

Protective cover
(H20-0439-03)

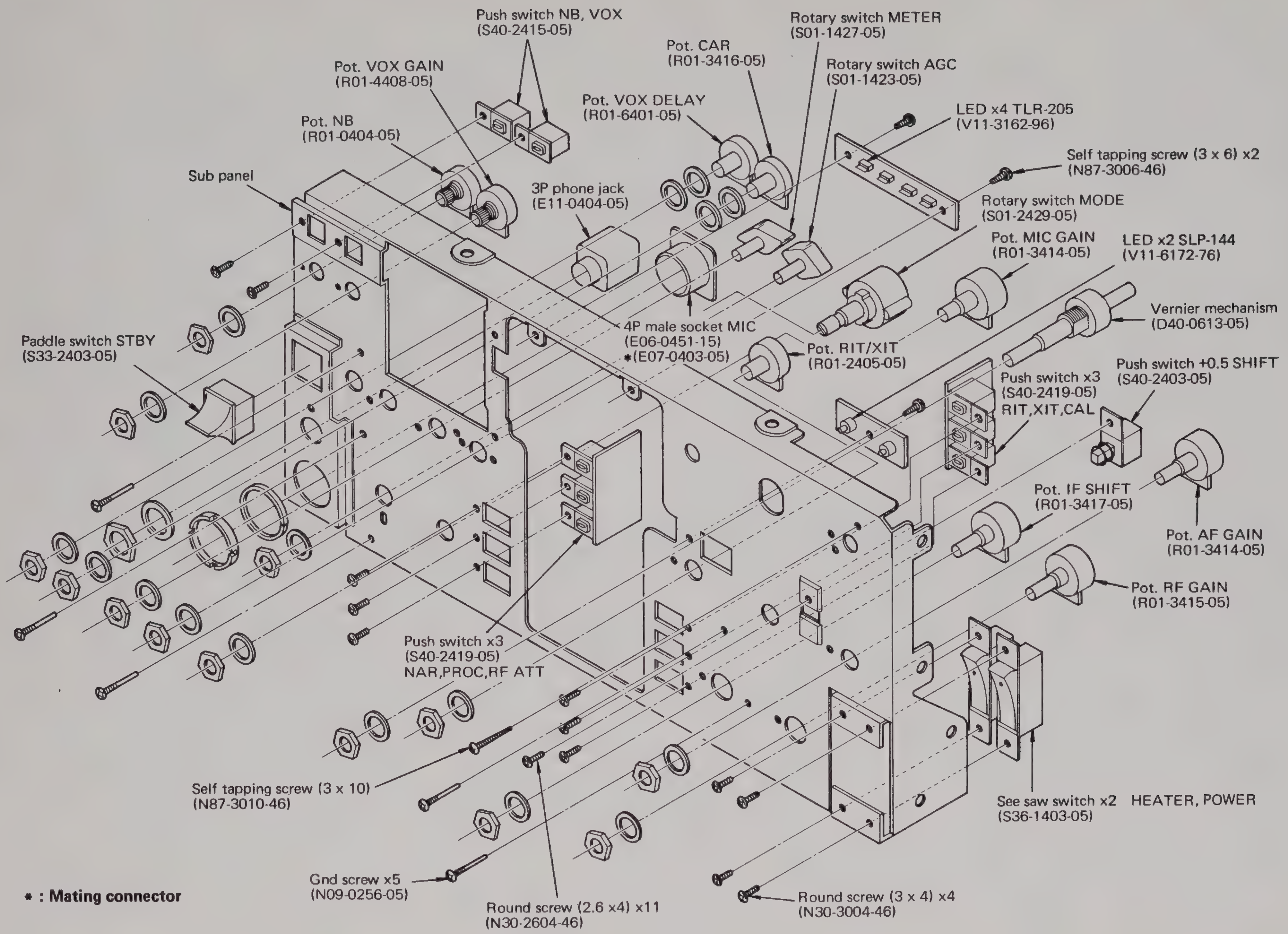
Packing fixture (F)
(H10-2539-02)

★Protective bag (H25-0120-04)
- 4P MIC plug (E07-0403-05) (W),(T),(X),(M)
- 7P DIN plug (E07-0751-05)
- Phone plug (E12-0001-05)
- Fuse 4A (F05-4022-05) (W),(T),(X),(M)
- Fuse 6A (F05-6021-05) (K),(M)
- Foot (large) x2 (J02-0049-14)
- Round crew (4 x25) x2 (N30-4025-46)

DISASSEMBLY


Pilot lamp (B30-0817-15)
Cushion (G13-0633-14)
Meter (B31-0630-05)
Front glass (small) (B10-0631-04)
Flat screw (3x6) x4 (N32-3006-46)
Switch mask x2 (B03-0520-04)
Pointer (B21-0501-04)
Knob bushing (J42-0409-04)
Knob 6 x 7 (K29-0738-04)
Pointer knob BAND (K21-0723-04)
Coil spring (G01-0804-04)
Dial scale (B) (B20-0816-04)
2 mm allen
Main knob (K21-0753-04)
Hex. head screw x4 (N99-0306-04)
3 mm allen
Round screw (2.6 x 4) (N30-2604-46)
Escutcheon glass (B10-0632-04)
Dial escutheon (B07-0630-05)
Pilot lamp x2 (B30-0819-05)
Dial scale (A) (B20-0818-04)
Push knob (K29-0713-04) +0.5 SHIFT
2 mm allen
Knob 5 PLATE (K29-0737-04)
Pointer knob MODE (K29-0715-04)
D spring x9 (G09-0410-05)
Knob1 x2 (K23-0738-04)
Front glass holder (J19-1351-04)
Knob x4 (K23-0745-04)
Front glass (large) (B10-0639-04)
Push knob x8 (K27-0414-04)
Panel (A20-2420-03)
Switch mask (B03-0519-04)
Paddle knob STBY (K29-0744-04)
Switch mask (F15-0632-04)

DISASSEMBLY



*** : Mating connector**

ADJUSTMENTS

TEST EQUIPMENT REQUIRED

1. VTVM or DVM

1) Input resistance: More than 1 MΩ
2) Voltage range: 1.5 to 1000V AC/DC

NOTE:

A high-precision voltmeter may be used.
However, accurate readings can not be obtained for high-impedance circuits.

2. RF VTVM

1) Input impedance: 1 MΩ and less than 3 pF.
2) Voltage range: 10 mV to 300V
3) Frequency range: 50 MHz or greater

3. AF VTVM

1) Frequency range: 50 Hz to 10 kHz
2) Input impedance: 1 MΩ or greater
3) Voltage range: 10 mV to 30V

4. AF GENERATOR (AG)

1) Frequency range: 200 Hz to 5 kHz
2) Output: 2 mV~ 1V, low distortion

5. AF DUMMY LOAD

1) Impedance: 8Ω
2) Dissipation: 3W or greater

6. RF DUMMY LOAD

1) Impedance: 50Ω
2) Dissipation: 100W continuous or greater
3) Frequency limits: 1.8 to 30 MHz

7. OSCILLOSCOPE

Requires high sensitivity and external synchronization capability.

8. SWEEP GENERATOR

1) Center frequency: 8 to 40 MHz
2) Sweep bandwidth: Maximum ±16 MHz
3) Output voltage: More than 0.1V

9. STANDARD SIGNAL GENERATOR (SSG)

1) Frequency range: 1.8 to 30 MHz
2) Output: −20 dB/0.1 μV~120 dB/1V
3) Output Z= 50Ω
Generator must be frequency stable.

10. FREQUENCY COUNTER

1) Minimum input voltage: 50 mV
2) Frequency range: Greater than 50 MHz

11. NOISE GENERATOR

Must generate ignition-like noise containing harmonics beyond 30 MHz.

12. Spectrum analyzer

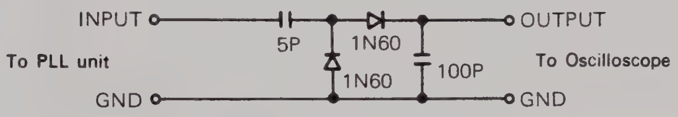
1) Frequency range: 100 kHz to 110 MHz
2) Bandwidth: 1 kHz to 3 MHz

NOTE:

R-1000 receiver may be used.

13. Detector

For adjustment of PLL unit BPF.



14. Directional coupler

15. 8P DIN connector

Refer to Fig. 9 on page 43.

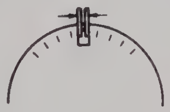
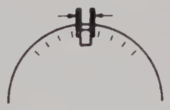
PREPARATION

Unless otherwise specified, set the controls as follows.

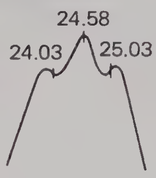
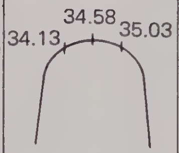
Rear panel

SG SW	OFF		
Front panel			
MODE	TUNE	MIC GAIN	MIN
CAR	MIN	RF GAIN	MAX
VOX	OFF	PROC	OFF
METER	IP	BAND	1.5
RIT/XIT	CENTERED	AGC	OFF
HEATER	OFF	VOX GAIN	MIN
NB	OFF	RIT	OFF
RF ATT	OFF	CAL	OFF
XIT	OFF	VOX DELAY	MIN
IF SHIFT	CENTERED	AF GAIN	MIN
		NB LEVEL	MIN

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	STBY : REC								
	Set the VFO dial to 50. At this time set the CAL control to the index.	F.counter	Rear panel	EXT VFO	VFO	L3		5550.00 kHz ±200 Hz	Repeat the adjustment several times until the frequency is within specification.
	Set the VFO dial to approx. 450. Set the CAL control dial calibrated under this VFO setting exactly to the index.			1P 7P (GND)		TC1		5950.00 kHz ±200 Hz	
	Tune to 5550.00 kHz with the main tuning knob.							The 50 kHz point on the dial scale must be aligned to the index.	
Dial calibration, electrical.	Tune to the CAL signal in order : 0, 100, 200, 300, 400, and 500 to check dial calibration at each 100 kHz point.				0 100 200 300 400 500	5.5 MHz 5.6 5.7 5.8 5.9 6.0		Within ±2.5 kHz	Check the dial scale (Electrically)
Backlash	Calibrate the dial at 0 kHz. Tune to 250 kHz, then reverse direction and tune back to 0 kHz without rocking the dial, and stop.							Less than 400Hz Backlash	Backlash
Dial calibration mechanical	Repeat electrical dial scale check procedure (for mechanical spec).							Calibration should come in contact with the dial pointer.	Check the dial scale (mechanically).
	RIT : Centered RIT SW : ON Set the VFO main control to 5750.000 kHz				IF	VR5	5750.000 kHz		
	Check that the same frequency is obtained when the RIT switch is turned ON and OFF.							Within ±50 Hz	
	RIT SW : ON VFO : 250 RIT control : fully counterclockwise (⊖ position) RIT control: fully clockwise (⊕ position).							−1.5 kHz or less +1.5 kHz or more Reference to the center (ϕ position of the RIT control).	

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
9. BPF-B adjustment	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D27 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the cathode of D50 (1S1587) to the jumper wire next to TC1 with a clip lead. Connect the RF output of the sweep generator to R111(100Ω) via a 15pF capacitor.	Sweep generator Oscilloscope	PLL	Q35 Ⓔ	PLL	T7 T8 T9 T17	Adjust T7~T9 until the response shown at the right is obtained. Then adjust T17 for maximum amplitude.		
10. BPF-C adjustment	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D26 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the cathode of D50 (1S1587) to the jumper wire next to TC1 with a clip lead.					T10 T11 T12 T18	Adjust T10 through T12 until the band response shown at right is obtained. Then adjust T18 for maximum amplitude.		
11. Carrier balance adjustment	IF SHIFT : Centered RF GAIN : Fully counter-clockwise	RF VTVM	IF	Drain of Q4	IF	TC2	Minimum		Reference approx. 5 mV
12. IF AMP adjustment	BAND : 1.5 VFO : 400 DRIVE : 12 : 00 RF GAIN : fully clockwise IF SHIFT : Centered RF ATT : OFF MODE : USB AGC : OFF NB SW : OFF	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil 1.8 RF coil 1.8 T2	Max. audio output		
	SG SW : OFF Connect the SSG output (1.9MHz, 40dB) to the antenna terminal. While adjusting, gradually decrease the SSG output level down to −6dB.				IF	L2 L5 L6 L7 L8 L10			

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	BAND : 14 VFO : 175 STBY : SEND Adjust the CAR control until the ALC meter reads maximum.				IF RF	L13 T4	Max. ALC meter reading		
	STBY : REC Disconnect clip lead from connector ⑦.								
15. IF TRAP adjustment	BAND : Between 1.5 and AUX. Connect the SSG (8.83 MHz, 80dB) to the ANT terminal.	Oscilloscope AF VTVM	Rear panel	EXT. SP	RF	L3 L4	Adjust alternately for minimum		Preset the slugs of L3 and L4 fully clockwise.
16. VFO MIX spurious adjustment	BAND : 3.5 VFO : 388 MODE : LSB Connect the SSG output (3.888 MHz, 60dB) to the ANT terminal. 1) Adjust the SSG frequency to obtain zero beat. 2) Turn the VFO tuning to dial 384 to obtain a spurious beat.	Oscilloscope AF VTVM	Rear panel	EXT. SP	PLL	VR1	minimum beat output		The position of VR1 after adjustment should be approximately centered.
17. S meter adjustment	AGC : OFF				IF	VR1	Set to the deflection starting point.		
	BAND : 14 VFO : 175 AGC : FAST Connect the SSG (14.174 MHz, 8dB) to the ANT terminal.	Oscilloscope AF VTVM	Rear panel	EXT. SP			Adjust the DRIVE control for maximum AF output.		
					IF	L8	Turn the coil slug counterclockwise until S-1 is obtained.		
	SSG output : 40dB					VR2	Set to S-9		Repeat S-1,9 adjustment several times.
18. NB adjustment	NB LEVEL : fully counterclockwise BAND : 14 VFO: 175 Connect the SSG output (14.175 MHz 60dB) to the ANT terminal.	DVM	AF	TP4	AF	T1 T2	Minimum		
	SSG output : 20dB Adjust as described above.								

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
21. Transmission spurious adjustment	Connect pin2 and 4 of connector ⑦ on the AF unit with a clip lead. Set the BAND switch to 18, and VFO to 125. Connect a power meter to the ANT terminal. Set the STBY switch to SEND and tune up.	Spectrum analyzer (receive 17.66MHz with a monitor receiver.)	Rear panel	ANT	RF	VR2	Minimum (Monitor level)	Less than −40dB	
	STBY : REC Disconnect clip lead from connector ⑦								
22. RF meter adjustment	BAND : 14 VFO : 175 METER : RF Connect a power meter to the ANT terminal. Tune up.				Rear panel	RF Meter Pot.	Set the meter to read 250 on the IP scale.		
	STBY : REC								
23. Carrier suppression adjustment	BAND : 14 VFO : 175 MODE : CW Connect power meter to ANT. STBY : SEND	Sync'ro scope	Rear panel	ANT					Tune-up for max RF output.
	MODE : USB				IF	VR4 TC1	Adjust alternately until minimum output is obtained.		
	MODE : LSB ↕ USB						Adjust until no level difference exists between LSB and USB.		
	MODE : CW Sync'ed scope level calibration						Note scope deflection level.		
	MODE : USB, LSB							Less than −50dB	Compared with CW.
	STBY : REC								
24. SSB frequency response adjustment	BAND : 14 VFO : 175 MODE : USB Connect the AG (1500 Hz, 7mV) to the MIC input connector. STBY : SEND Tune up. Set to 50W output with MIC GAIN control.	Power meter Sync'ed scope	Rear panel	ANT					

ADJUSTMENTS

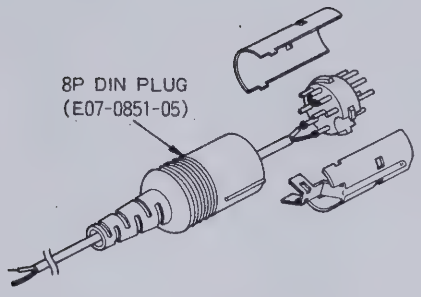


Fig. 9 8P DIN connector

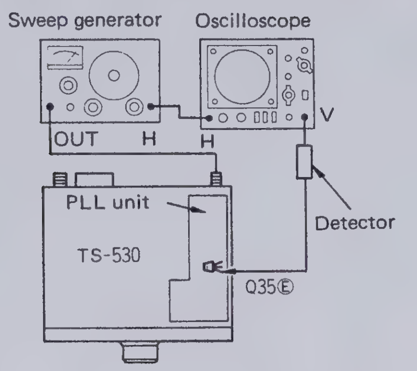


Fig. 10 (8) BPF-A, (9) BPF-B, (10)BPF-C

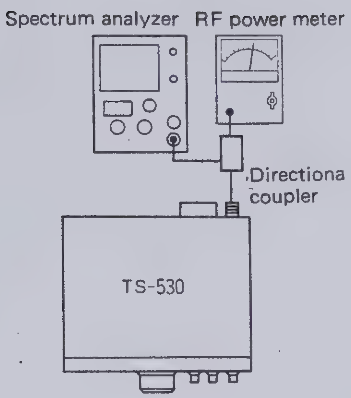
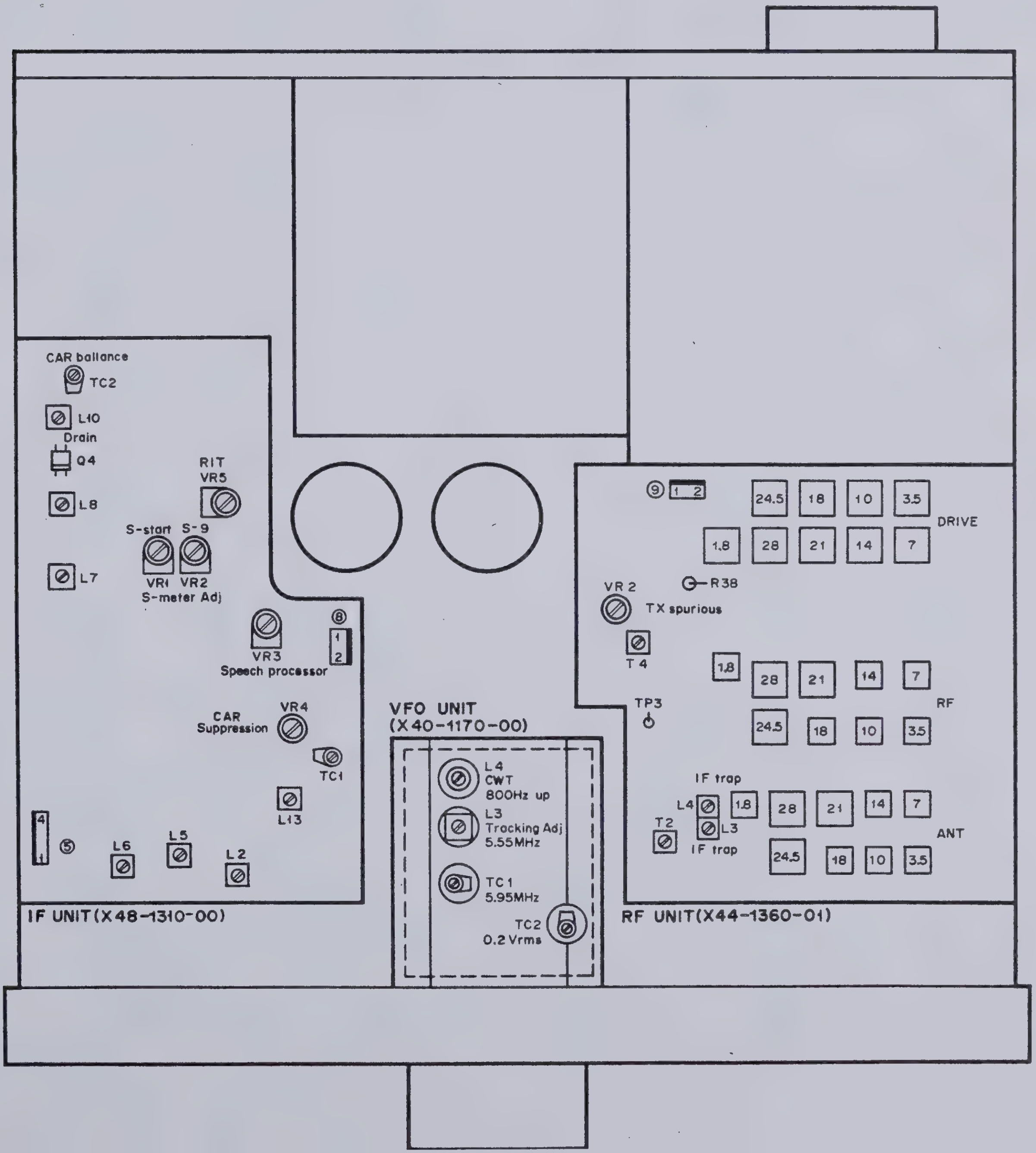


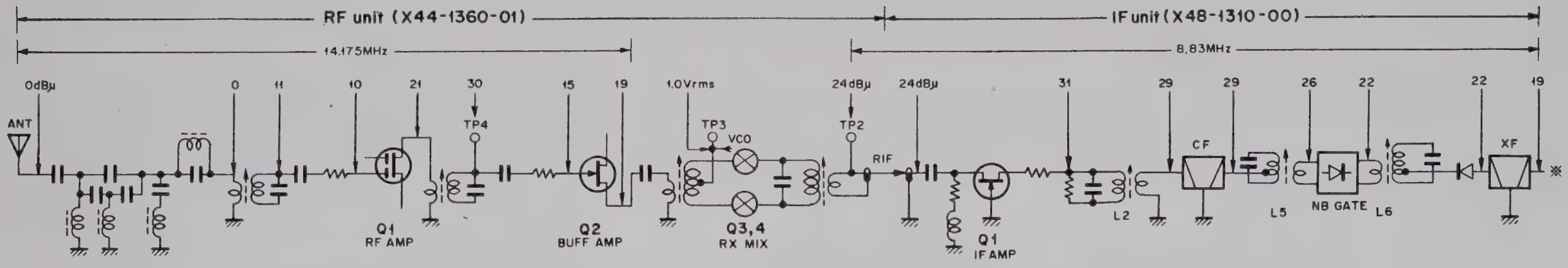
Fig. 11 (21) TX SPURIOUS

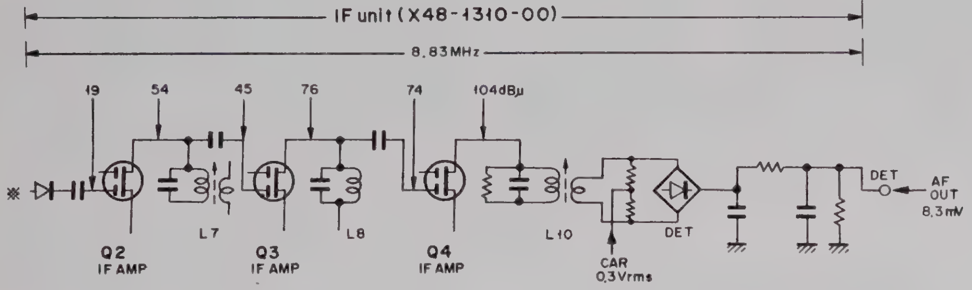
▼TOP VIEW



LEVEL DIAGRAM

RECEIVER SECTION

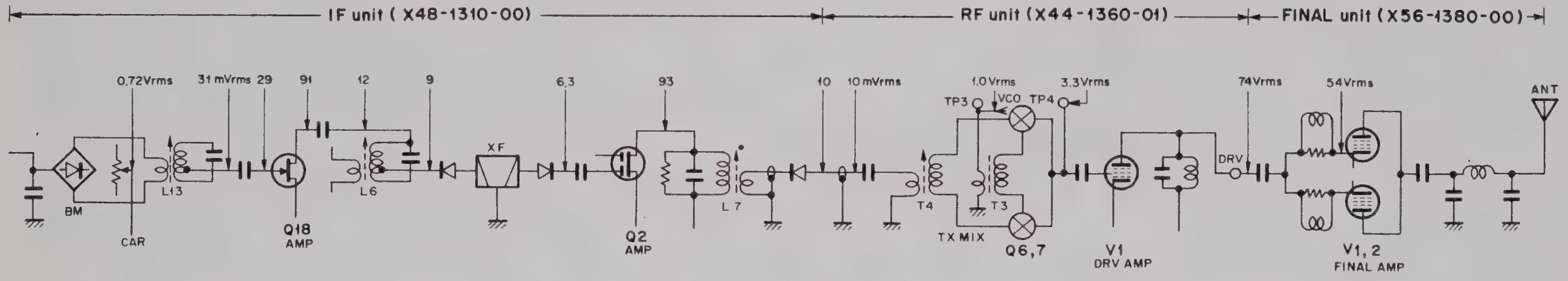




NOTES:

1. The figures shown are signal generator output required for a constant audio output with a constant AF gain control setting. Set the AF gain control for 0.63V/ 8Ω (50 mW) audio output 0 dBμ signal generator input at 14.175 MHz.
2. To inject signal generator output connect a 0.04μF 50V capacitor between the signal generator and the check point.

TRANSMITTER SECTION



NOTES:

1. Levels are measured at 14.175 MHz in the CW MODE and SG SW OFF. Carrier level is adjusted until the meter indicates the maximum on-scale ALC reading.
2. All voltage measurements are read from an RF VTVM.
3. A probe with a capacitance of less than 3PF should be used and the ground should be made near the point of measurement.

VFO-240

Ref. No.	Parts No.	Description	Re-marks
	E06-0852-05	8P DIN socket VFO OUT	
	E30-1623-05	GND cable (accessory)	
	E30-1628-15	VFO cable (accessory)	
	E31-2091-05	Connector with lead (A)	☆
	E31-2092-05	Connector with lead (B)	☆
	G09-0410-05	D spring φ6 RIT,FUNCTION	
	H01-2748-04	Carton case (inside) K,W	☆
	H01-2749-04	Carton case (inside) T	☆
	H10-2525-02	Packing fixture (R)	
	H10-2545-02	Packing fixture (F)	
	H20-0276-03	Protective cover	
	H25-0117-04	Accessory bag	
	J02-0049-14	Foot (large)	
	J61-0019-05	Vinyle tie	
	K29-0715-04	Pointer knob FUNCTION	
	K29-0738-04	Knob 6 RIT	
	K29-0745-04	Push knob (square) RIT, T-F SET	☆
	N14-0115-05	Flange nut GND	
	N14-0509-05	Wing nut GND	
	N15-1040-46	Washer GND	
	N16-0040-46	Spring washer GND	
	N30-4012-46	Round screw Foot	
	N30-4016-46	Round screw GND	
	N30-4025-46	Round screw Foot (accessory)	
	N35-3006-41	Bind screw Case	
	N87-4012-46	Self tapping screw Foot	
	N99-0306-04	Hex. head screw VFO	
	N99-0308-04	Hex. head screw Front glass	☆
D1	V11-6172-76	LED SLP-144	
	X41-1270-01	Switch unit	☆
	X60-1150-01	VFO ass'y unit	

SWITCH UNIT (X41-1270-01)

Ref. No.	Parts No.	Description	Re-marks
	E23-0047-04	Square terminal	
	E23-0401-05	Round terminal	
	E40-0216-05	Mini connect wafer 2P	
	E40-0474-05	Mini connect wafer 4P L type	
	E40-0774-05	Mini connect wafer 7P L type	
VR1	R01-2407-05	Pot. 5kΩ (B) RIT	☆
VR2	R12-3025-05	Trim. pot 10kΩ (B)	
	R92-0150-05	Short jumper	
S1	S29-1418-05	Slide rotary switch	☆
S2	S40-2424-05	Push switch T-F SET	☆
S3	S40-2425-05	Push switch RIT	☆
RL1	S51-2408-05	Relay G2V-2	
D1	V11-0076-05	Diode 1S1555	
D2	V11-3162-86	LED TLG-205	
D3	V11-3163-16	LED TLY-205	

VFO ASS'Y UNIT (X60-1150-01)

Ref. No.	Parts No.	Description	Re-marks
	B07-0630-05	Dial escutcheon	
	B10-0632-04	Escutcheon glass	
	B20-0816-04	Dial scale (B)	
	B20-0818-04	Dial scale (A)	☆
	B30-0819-05	Pilot lamp	
	B42-1645-04	Seal Bottom	
	B42-1671-04	Seal Top	
	G01-0804-04	Coil spring	
	K21-0753-04	Main knob	
	X40-1170-00	VFO unit	

VFO UNIT (X40-1170-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0456-05	C 0.047µF 25V	
C4	CC45CG1H050C	C 5pF ±0.25pF	
C6	C91-0456-05	C 0.047µF 25V	
C7	CC45LG1H151J	C 150pF	
C9	CC45LG1H121J	C 120pF	
C12	CC45LG1H680J	C 68pF	
C13	CC45CG1H220J	C 22pF	
C14	CC45PG1H100D	C 10pF ±0.5pF	
C15,16	CC45LG1H151J	C 150pF	
C17	CC45CH1H020C	C 2pF ±0.25pF	
C18	C91-0456-05	C 0.047µF 25V	
C21	CC45SL1H390J	C 39pF	
C22	CC45CH1H100D	C 10pF ±0.5pF	
C23	CC45SL1H390J	C 39pF	
C24	C91-0456-05	C 0.047µF 25V	
TC1	C05-0009-15	Ceramic trimmer 6pF	
TC2	C05-0013-15	Ceramic trimmer 20pF	
VC1	C02-0019-05	Variable cap.	
	D40-0614-05	Dial mechanism ass'y	
	E40-0574-05	Mini connect wafer 5P	
	F29-0014-05	Insulating washer	
L1	L32-0628-05	OSC coil	
L2	L33-0025-05	Choke coil 1µH	
L3	L32-0629-05	OSC coil	
L4	L32-0609-05	OSC coil	
L5	L40-1021-03	Ferri-inductor 1mH	
L6	L40-4711-03	Ferri-inductor 470µH	
L7	L40-1021-03	Ferri-inductor 1mH	
L8	L40-1501-03	Ferri-inductor 15µH	
L9~11	L40-4711-03	Ferri-inductor 470µH	
	R92-0150-05	Short jumper	
Q1,2	V09-0011-05	FET 2SK19(Y)	
Q3	V03-0079-05	TR 2SC460(B)	
Q4	V03-1959-06	TR 2SC1959(Y)	
D1	V11-0414-05	Diode 1S2588	
D2	V11-4161-36	Vari-cap. 1SV53A	

AT-230

SPECIFICATIONS

ANTENNA COUPLER

Frequency Range	9 amateur bands from 1.8 to 29.7 MHz
Input Impedance	50Ω
Output Impedance	10 to 500Ω, unbalanced
Through Power	200W at max.
Insertion Loss	Less than 0.5 dB in matched state
Pi-L	1.8 MHz only
Output Impedance	20 to 500Ω, unbalanced
Through Power	100W at max.

WATTMETER

Type	Through-line wattmeter
Frequency Range	1.8 to 30 MHz
Measurable RF Power	Up to 20/200W, switched
Kinds of RF Power	Forward or reflected power, switched.
Net weight	3.4 kg (7.5 lbs.) approx.
Impedance	50Ω
Accuracy	Better than ±10% of full scale

SWR METER

SWR Detection	Toroid core direction coupler
Measurable Range	1.1 to 10
Min. Power Required	4W

GENERAL

Connectors	
INPUT	UHF type, 50Ω
ANT-1	UHF type
ANT-2	UHF type
ANT-3	Stud and wing nut
Dimensions	W 180 mm (7-3/32")
	H 133 mm (5-15/64")
	D 288 mm (11-11/32")

NOTE : The circuit and ratings may change without notice due to developments in technology.

PARTS LIST

☆ New parts

Ref. No.	Parts No.	Description	Re-marks
		AT-230 GENERAL	
	A01-0786-03	Case (upper)	☆
	A01-0788-02	Case (lower)	☆
	A20-2397-02	Panel	☆
	B07-0632-08	Meter escutcheon (T)	☆
	B07-0633-08	Meter escutcheon (K)(W)	☆
	B20-0808-04	Knob skirt	
	B31-0621-08	Meter	
	B46-0058-00	Warranty card (K)	
	B50-2756-08	Operating manual (K)(W)	☆
	B50-2757-08	Operating manual (T)	☆
VC1, 2	C02-0016-08	Variable cap 300pF 1.2kV	
C7	C91-0419-05	C 82pF 3kV	☆
C8	C91-0402-05	C 12pF 3kV	☆
	D23-0061-04	Bearing	
	E04-0102-05	UHF type receptacle	
	E23-0015-04	Gnd lug ϕ3	
	E23-0408-05	Terminal	
	F09-0402-05	Insulating cover	
	F29-0402-08	Insulator	
	G13-0621-04	Cushion	
	H01-2714-04	Carton case (inside)(K)(W)	☆
	H01-2715-04	Carton case (inside)(T)	☆
	H10-2525-02	Packing fixture (R)	☆
	H10-2545-02	Packing fixture (F)	☆
	J02-0049-14	Foot (large)	
	J32 1030-04	Round boss	
	K21-0715-04	Main knob R, X Tune	
	K21-0745-08	Knob, BAND, ANT	
	K23-0719-04	Knob, CAL	
	K23-0720-04	Switch paddle	
L3	L34-0992-08	Coil	☆
L4	L34-0993-08	Coil	☆
L5	L34-0994-08	Coil	☆
	N14-0506-08	Wing nut, M5 ANT3, GND	
	S01-2418-08	Rotary switch, ANT	
	S01-5404-08	Rotary switch, BAND	☆
	W02-0302-08	Switch module	
	W02-0303-08	Detector module	
		SWITCH UNIT (W02-0302-08)	
VR1	R12-1024-05	Trim. pot 1kΩ (B)	
VR2	R12-4020-05	Trim. pot 50kΩ (B)	
VR3	R12-3420-08	Trim. pot 20kΩ (B)	
VR4	R05-3407-08	Pot. 50kΩ (B) CAL	
R3	RD14BB2E511J	Carbon resistor 510Ω ±5% 1/4W	
R4	RD14BB2E104J	Carbon resistor 100kΩ ±5% 1/4W	
	S36-2026-15	Paddle switch × 4	
		DETECTOR MODULE (W02-0303-08)	
C1, 2	FM05ZC150J5	Mica 15pF 500V	
C6	FM05ZC150J5	Mica 15pF 500V	
R1, 2	RD14BB2E510J	Carbon resistor 51Ω ±5% 1/4W	
D1, 2	V11-7763-26	Diode 2-1K261 × 2	
L1, 2	L39-0403-08	Detector coil	

SCHEMATIC ABBREVIATION

Connector No.	Terminal name	
VFO ass'y unit (X60-1150-01)		
	RLC	From MODE SW S-18-3, 5
	RIT	RIT voltage input
	VFB	VFO B + 9V
	G	
	VFO	VFO output
PLL unit (X50-1680-01)		
①		BAND SW input information
②	A,B,C,D	BCD code from counter unit
	BLK	Blanking signal
	12	B + 12V
③	1K	Reference signal from PLL Q24
	CON	To counter unit from PLL Q29
④	MKR	Marker output
	VCO	VCO output
⑤ 、⑥	VFO	VFO input
⑦	CAR	Carrier output
⑧	RLS	MODE SW S18-3
	TXC	MODE SW S18-3
	IFS	IF shift arm of VR-3
	USB	From S18-1 + 9V on USB
	LSB	From S18-1 + 9V on LSB
	MS	Calibrator SW S1-1
	9	B + 9V
Counter unit (X54-1540-00)		
①	0.5	0.5 MHz shift signal
	12	B + 12V
②	12	B + 12V
	CON	Counter signal input
	BLK	Blanking signal
	1K	Reference signal 1 kHz
	A~D	BCD input from PLL
	–6	B – 6V
③	AUX~28B	Band information to PLL
④ 、⑤	AUX~29.5	Band SW information to + 9V on any band
IF unit (X48-1310-00)		
①	12	B + 12V
	RIF	Receiver IF input
②	NBI	To noise blanker amp
	NSG	Noise blanker gate signal
③	210A	B + 210V
	210B	B + 210V
	300B	B + 300V
④	300A	B + 300V
⑤	CWN~SSB	To NAR SW S4-1,2
⑥	TIF	Transceiver IF output
	AGC	Output for AGC
⑦	DET	Detector output
	RB2	Receiver amp bias
⑧	CAR	Carrier input
⑨	VXI	To VOX circuit
⑩	TM	Meter select SW S-13 arm
	M	S meter voltage
	ALM	To ALC meter DC signal
	MIC	MIC input
	NRM	Processor SW OFF
	PRC	Processor SW ON
⑪	MV1	Top of MIC gain control
	MV2	Arm of MIC gain control

Connector No.	Terminal name	
⑫	–6	B – 6V input
	AGO	AGC off
	AGS	AGC slow
	RFG	Arm of RF gain control
	SSB	From mode SW S18-4
	9	B + 9V
	CV	Arm of carrier level control
⑬	RSC	Receiver RIT
	XIT	Transmitter RIT
	RIT	RIT voltage to VFO
	RTI	RIT SW S3-1
⑭	ALC	ALC input from AF unit Q31
	RLT	+ 9V when transmit
	RLR	+ 9V when receive
	RL	Relay voltage
RF unit (X44-1360-01)		
①	AUX~24.5	To counter unit + 9V on any band
②	28,29	To counter unit + 9V on any band
	9V	B + 9V
③	ANT	Receiver antenna
	RLR	+ 9V at receive
④	MKR	Marker signal input
⑤	AGC	AGC input
	RIF	Receiver IF output
⑥	TOF	Transmit stop signal input for WARC
	12	B + 12V
	MXB	MIXer B + turn on signal
⑦	12	B + 12V
	TIF	Transmit IF signal input
	300A	From IF unit + 300V
⑧	DRB	Control grid bias for 12BY7A
	RB1	Receiver bias voltage
⑨	H	Heater voltage
	210A	B + 210V
	VCO	VCO input
	DRV	Drive voltage to 6146B
	NC	Neutralization
AF unit (X49-1150-00)		
①	SSB	+ 9V on SSB mode
	VXI	VOX amp input
②	DET	Detector signal from IF unit
	NBI	Noise blanker amp input
③	AV2	Arm of AF gain control
	AV3	Top of AF gain control
	STE	To ground in CW and CW NAR
	KEY	To ground in tune and USB/LSB
④	SP	Speaker internal
	STS	Side tone SW
⑤	SS	Stand by SW
	VXS	VOX SW to ground when VOX ON
	VXD	VOX delay control
	SP	Speaker internal
⑥	VR3	Final grid bias control
	KEY	To ground in tune and USB/LSB
	VR1	Final grid bias control
	AV	Anti VOX signal input
	SS	Stand by SW
	RL	Relay voltage
	9	B + 9V
⑦	RB1	Bias for Q1 RF amp on RF unit
	MXB	B + to MIXer from Q29 on AF unit
	TOF	TX stop signal for WARC
	DRB	Bias for control grid of 12BY7A

SCHEMATIC ABBREVIATION

Connector No.	Terminal name	
VFO ass'y unit (X60-1150-01)		
	RLC	From MODE SW S-18-3, 5
	RIT	RIT voltage input
	VFB	VFO B + 9V
	G	
	VFO	VFO output
PLL unit (X50-1680-01)		
①		BAND SW input information
②	A,B,C,D	BCD code from counter unit
	BLK	Blanking signal
	12	B + 12V
③	1K	Reference signal from PLL Q24
	CON	To counter unit from PLL Q29
④	MKR	Marker output
	VCO	VCO output
⑤ 、⑥	VFO	VFO input
⑦	CAR	Carrier output
⑧	RLS	MODE SW S18-3
	TXC	MODE SW S18-3
	IFS	IF shift arm of VR-3
	USB	From S18-1 + 9V on USB
	LSB	From S18-1 + 9V on LSB
	MS	Calibrator SW S1-1
	9	B + 9V
Counter unit (X54-1540-00)		
①	0.5	0.5 MHz shift signal
	12	B + 12V
②	12	B + 12V
	CON	Counter signal input
	BLK	Blanking signal
	1K	Reference signal 1 kHz
	A~D	BCD input from PLL
	−6	B − 6V
③	AUX~28B	Band information to PLL
④ 、⑤	AUX~29.5	Band SW information to + 9V on any band
IF unit (X48-1310-00)		
①	12	B + 12V
	RIF	Receiver IF input
②	NBI	To noise blanker amp
	NSG	Noise blanker gate signal
③	210A	B + 210V
	210B	B + 210V
	300B	B + 300V
④	300A	B + 300V
⑤	CWN~SSB	To NAR SW S4-1,2
⑥	TIF	Transceiver IF output
	AGC	Output for AGC
⑦	DET	Detector output
	RB2	Receiver amp bias
⑧	CAR	Carrier input
⑨	VXI	To VOX circuit
⑩	TM	Meter select SW S-13 arm
	M	S meter voltage
	ALM	To ALC meter DC signal
	MIC	MIC input
	NRM	Processor SW OFF
	PRC	Processor SW ON
⑪	MV1	Top of MIC gain control
	MV2	Arm of MIC gain control

Connector No.	Terminal name	
⑫	−6	B − 6V input
	AGO	AGC off
	AGS	AGC slow
	RFG	Arm of RF gain control
	SSB	From mode SW S18-4
	9	B + 9V
	CV	Arm of carrier level control
⑬	RSC	Receiver RIT
	XIT	Transmitter RIT
	RIT	RIT voltage to VFO
	RTI	RIT SW S3-1
⑭	ALC	ALC input from AF unit Q31
	RLT	+ 9V when transmit
	RLR	+ 9V when receive
	RL	Relay voltage
RF unit (X44-1360-01)		
①	AUX~24.5	To counter unit + 9V on any band
②	28,29	To counter unit + 9V on any band
	9V	B + 9V
③	ANT	Receiver antenna
	RLR	+ 9V at receive
④	MKR	Marker signal input
⑤	AGC	AGC input
	RIF	Receiver IF output
⑥	TOF	Transmit stop signal input for WARC
	12	B + 12V
	MXB	MIXer B + turn on signal
⑦	12	B + 12V
	TIF	Transmit IF signal input
	300A	From IF unit + 300V
⑧	DRB	Control grid bias for 12BY7A
	RB1	Receiver bias voltage
⑨	H	Heater voltage
	210A	B + 210V
	VCO	VCO input
	DRV	Drive voltage to 6146B
	NC	Neutralization
AF unit (X49-1150-00)		
①	SSB	+ 9V on SSB mode
	VXI	VOX amp input
②	DET	Detector signal from IF unit
	NBI	Noise blanker amp input
③	AV2	Arm of AF gain control
	AV3	Top of AF gain control
	STE	To ground in CW and CW NAR
	KEY	To ground in tune and USB/LSB
④	SP	Speaker internal
	STS	Side tone SW
⑤	SS	Stand by SW
	VXS	VOX SW to ground when VOX ON
	VXD	VOX delay control
	SP	Speaker internal
⑥	VR3	Final grid bias control
	KEY	To ground in tune and USB/LSB
	VR1	Final grid bias control
	AV	Anti VOX signal input
	SS	Stand by SW
	RL	Relay voltage
	9	B + 9V
⑦	RB1	Bias for Q1 RF amp on RF unit
	MXB	B + to MIXer from Q29 on AF unit
	TOF	TX stop signal for WARC
	DRB	Bias for control grid of 12BY7A

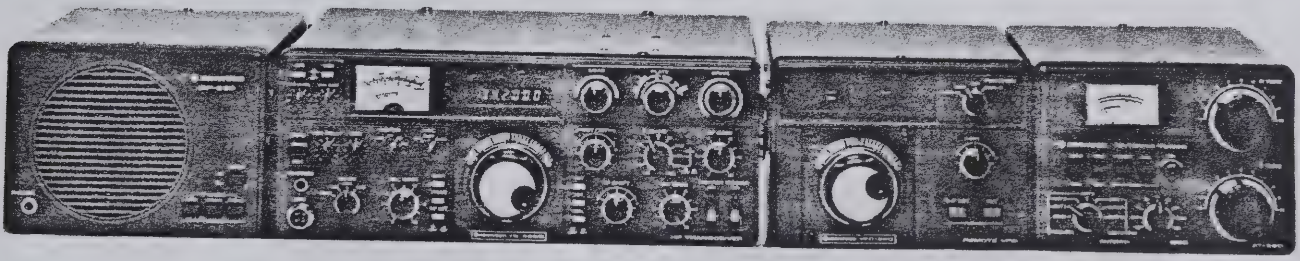
KENWOOD

SERVICE MANUAL

Model TS-530S

SP-230, VFO-240, AT-230

HF TRANSCEIVER


SP-230 TS-530S VFO-240 AT-230

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SP-230

SPECIFICATIONS

Speaker used: 12 cm dia.
Rated Input: 2 Watts
Impedance: 8Ω
Frequency response: 100Hz to 5kHz.
Filter cut-off frequency,
LOW: 400Hz, –3dB.
HIGH 1: 3kHz, –3dB.
HIGH 2: 1.5kHz, –3dB.
HIGH 1 + HIGH 2: 1 kHz, –3dB.
Filter attenuation: –6dB/oct.
Dimensions: W 180 mm (7-1/16")
H 133 mm (5-1/4")
D 287 mm (11-5/16")
Net weight: 1.8 kg. (4.0 lbs.)
Accessories furnished: Speaker cord, 1 pc.
(E14-0101-05)
Extension foot, 2 pcs.
(J02-0049-14)
Screw, M4 x 12, 2 pcs.
(N30-4012-41)
1 pin plug, 2 pcs.
(E20-1610-05)

Ref. No.	Parts No.	Description	Re-marks
	A01-0786-03	Case (upper)	
	A01-0789-02	Case (lower)	☆
	A20-2399-05	Panel (T)	☆
	A20-2400-05	Panel (K)(W)	☆
	B46-0058-00	Warranty card (K)	
	B50-2759-00	Operating manual (K)(W)	☆
	B50-2760-00	Operating manual (T)	☆
	E11-0404-05	Phone jack	
	E12-0001-05	Phone plug	
	E13-0361-05	3P Pin jack	
	E14-0101-05	1P Pin plug	
	E30-1610-05	Connector with lead	
	G53-0502-04	Packing	
	H01-2723-04	Carton (inside)(K)(W)	☆
	H01-2724-04	Carton case (inside)(T)	☆
	H10-2523-02	Packing fixture (F)	
	H10-2525-02	Packing fixture (R)	
	H20-0276-03	Protective cover	
	H25-0049-03	Protective bag	
	J02-0049-14	Foot	
	K29-0716-04	Push knob	
	L79-0443-25	Filter	
	RS14AB3D8R2J	Solid 8.2Ω 2W	
	S40-2414-05	Push switch INPUT	
	S42-3401-05	Push switch LOW, HIGH 1, 2	
	T06-0011-05	Speaker	

A product of
TRIO-KENWOOD CORPORATION
17-5, 2-chome, Shibuya, Shibuya-ku, Tokyo 150, Japan

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SP-230

SPECIFICATIONS

Speaker used:	12 cm dia.
Rated Input:	2 Watts
Impedance:	8Ω
Frequency response:	100Hz to 5kHz.
Filter cut-off frequency,	
LOW:	400Hz, –3dB.
HIGH 1:	3kHz, –3dB.
HIGH 2:	1.5kHz, –3dB.
HIGH 1 + HIGH 2:	1 kHz, –3dB.
Filter attenuation:	–6dB/oct.
Dimensions:	W 180 mm (7-1/16") H 133 mm (5-1/4") D 287 mm (11-5/16")
Net weight:	1.8 kg. (4.0 lbs.)
Accessories furnished:	Speaker cord, 1 pc. (E14-0101-05) Extension foot, 2 pcs. (J02-0049-14) Screw, M4 x 12, 2 pcs. (N30-4012-41) 1 pin plug, 2 pcs. (E20-1610-05)

Ref. No.	Parts No.	Description	Re-marks
	A01-0786-03	Case (upper)	
	A01-0789-02	Case (lower)	☆
	A20-2399-05	Panel (T)	☆
	A20-2400-05	Panel (K)(W)	☆
	B46-0058-00	Warranty card (K)	
	B50-2759-00	Operating manual (K)(W)	☆
	B50-2760-00	Operating manual (T)	☆
	E11-0404-05	Phone jack	
	E12-0001-05	Phone plug	
	E13-0361-05	3P Pin jack	
	E14-0101-05	1P Pin plug	
	E30-1610-05	Connector with lead	
	G53-0502-04	Packing	
	H01-2723-04	Carton (inside)(K)(W)	☆
	H01-2724-04	Carton case (inside)(T)	☆
	H10-2523-02	Packing fixture (F)	
	H10-2525-02	Packing fixture (R)	
	H20-0276-03	Protective cover	
	H25-0049-03	Protective bag	
	J02-0049-14	Foot	
	K29-0716-04	Push knob	
	L79-0443-25	Filter	
	RS14AB3D8R2J	Solid 8.2Ω 2W	
	S40-2414-05	Push switch INPUT	
	S42-3401-05	Push switch LOW, HIGH 1, 2	
	T06-0011-05	Speaker	

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John
Travis

ORIG ⑧

SPECIFICATIONS

GENERAL

Frequency Range	160 m Band 1.8~2.0 MHz 80 m Band 3.5~4.0 MHz 40 m Band 7.0~7.3 MHz * 30 m Band 10.1~10.15 MHz (10.0 MHz WWV) 20 m Band 14.0~14.35 MHz * 17 m Band 18.068~18.168 MHz 15 m Band 21.0~21.45 MHz * 12 m Band 24.89~24.99 MHz 10 m Band 28.0~29.7 MHz
Modes	SSB/CW
Frequency Stability	Within 1 kHz during the first hour after 1 minute of warmup. Within 100 Hz during any 30 minute period after warmup.
Power Requirement	120V AC (220,240V modifiable) 50/60 Hz : (K) 120/220V AC (Selectable) 50/60 Hz : (M) 220/240V AC (Selectable) 50/60 Hz : (T)(W)(X)
Power Consumption	Transmit : 295 watts Receive : 27 watts (with heaters off)
Dimensions	333 (13.3) x 133 (5.3) x 333 (13.3) mm (inch)
Weight	12.8 kg (28.2 lbs)

(K) : USA
(T) : Britain
(W) : Europe
(X) : Australia
(M) : General market

TRANSMITTER

* Final Power Input	220W PEP for SSB operation 180W DC for CW operation
Audio Input Impedance	500Ω~50kΩ
RF Output Impedance	50Ω~75Ω
Carrier Suppression	Better than 40 dB
Sideband Suppression	Better than 50 dB
Spurious Radiation	Better than 60 dB
Harmonic Radiation	Better than 40 dB
Audio Freq. Response	400 to 2,600 Hz within –6 dB

RECEIVER

Receiver Sensitivity	0.25μV at 10 dB S + N/N
Image Ratio	Better than 60 dB
IF Rejection	Better than 70 dB
Receiver Selectivity	
SSB/CW	2.4 kHz (–6 dB), 4.2 kHz (–60 dB) CW Optional Filter YK-88C 500 Hz (–6 dB), 1.5 kHz (–60 dB) YK-88CN 270 Hz (–6 dB), 1.1 kHz (–60 dB) SSB Optional Filter YK-88SN 1.8 kHz (–6 dB), 3.3 kHz (–60 dB)
Audio Output Impedance	8~16Ω
Audio Output	1.5 W (8Ω)

* Will transmit on the new 30, 17, and 12 meter bands.
Diodes installed for preventing accidental transmission before government Amateur authorization.

NOTE : The circuit and ratings may change without notice due to developments in technology.

CIRCUIT DESCRIPTION

This is mixed with the VCO output for each band by MIX (1) to a frequency given in **Table 4**, which is then routed through LPF (1), amplified, and wave-shaped to a digital signal. A programmable divider divides this signal into a 500 kHz output. This programmable divider is preset, as shown in **Table 4**, by the BCD signal which is counter-generated from information coming from the band switch. The phase comparator used is a Motorola MC4044P. The loop filter is made of completely discrete components to minimize VCO spurious content.

Six VCOs cover all bands. If the PLL unlocks for any reason, it will be detected from the phase comparator output. This will turn off the VCO output to prevent spurious radiation and, at the same time, the display will be blanked to inform the operator of unlock status.

BAND	RX. Tx frequency (MHz)	VCO (MHz)	MIX (1) input (MHz)	MIX (1) output (MHz)	Division ratio	DCBA
1.5	1.5 ~2.0	10.33 ~10.83	14.33 ~14.83	4.0	1/8	1 0 0 0
3.5	3.5 ~4.0	12.33 ~12.83	14.33 ~14.83	2.0	1/4	1 1 0 0
7	7.0 ~7.5	15.83 ~16.33	14.33 ~14.83	1.5	1/3	1 1 0 1
10	10.0 ~10.5	18.83 ~19.33	14.33 ~14.83	4.5	1/9	0 1 1 1
14	14.0 ~14.5	22.83 ~23.33	24.33 ~24.83	1.5	1/3	1 1 0 1
18	18.0 ~18.5	26.83 ~27.33	24.33 ~24.83	2.5	1/5	1 0 1 1
21	21.0 ~21.5	29.83 ~30.33	34.33 ~34.83	4.5	1/9	0 1 1 1
24.5	24.5 ~25.0	33.33 ~33.83	34.33 ~34.83	1.0	1/2	1 1 1 0
28	28.0 ~28.5	36.83 ~37.33	〃	2.5	1/5	1 0 1 1
28.5	28.5 ~29.0	37.33 ~37.83	〃	3.0	1/6	1 0 1 0
29	29.0 ~29.5	37.83 ~38.33	〃	3.5	1/7	1 0 0 1
29.5	29.5 ~30.0	38.33 ~38.83	〃	4.0	1/8	1 0 0 0

Table 3 Frequency chart

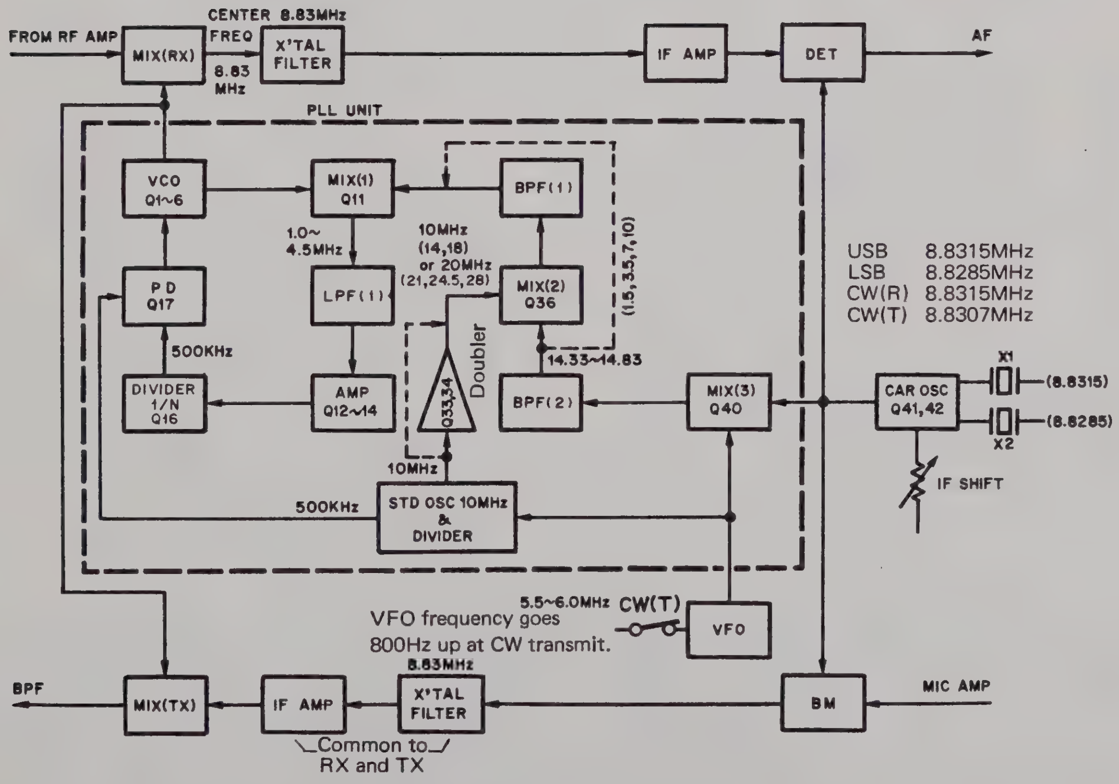


Fig. 1 TS-530 Frequency configuration

CIRCUIT DESCRIPTION

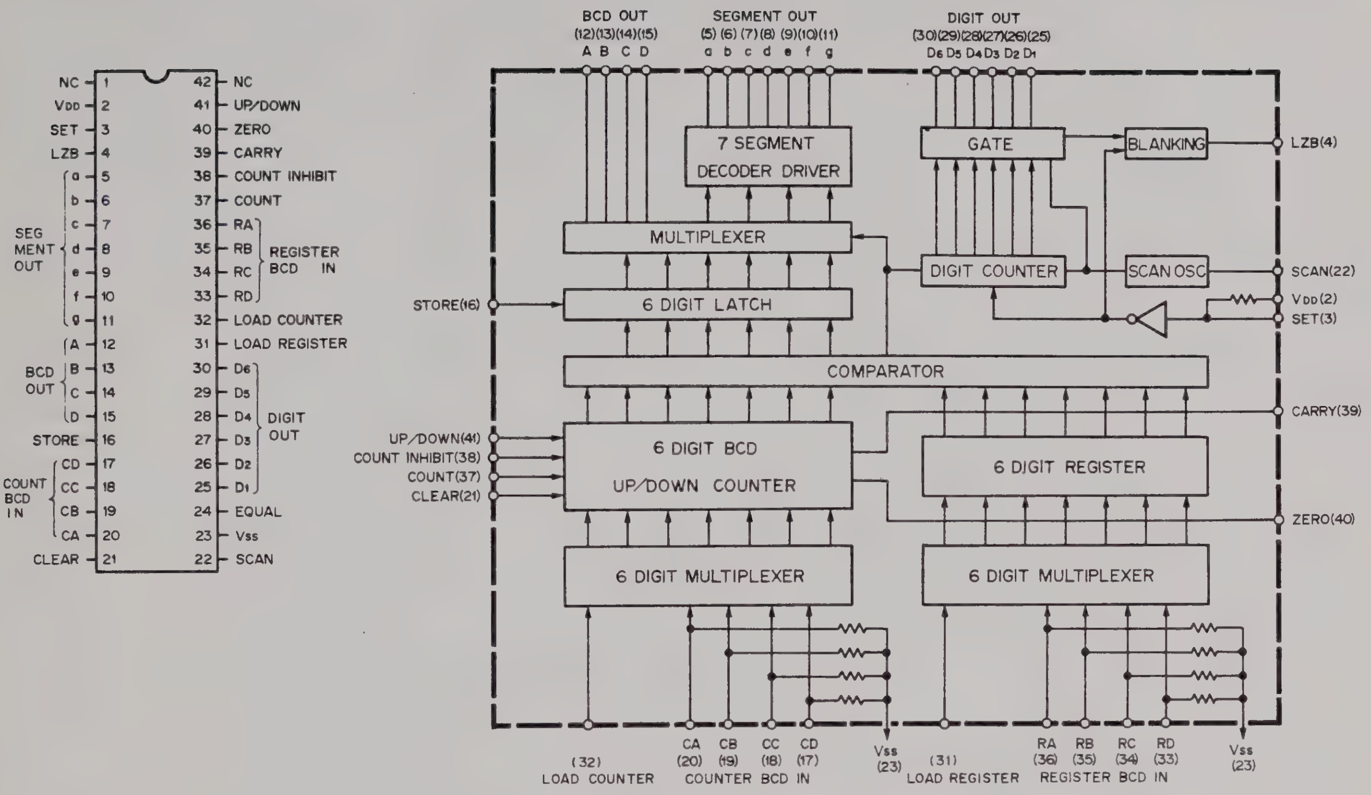

NC 1, VDD 2, SET 3, LZB 4, a 5, b 6, c 7, d 8, e 9, f 10, g 11, A 12, B 13, C 14, D 15, STORE 16, CD 17, CC 18, CB 19, CA 20, CLEAR 21
SEG MENT OUT
BCD OUT
COUNT BCD IN
42 NC, 41 UP/DOWN, 40 ZERO, 39 CARRY, 38 COUNT INHIBIT, 37 COUNT, 36 RA, 35 RB, 34 RC, 33 RD, 32 LOAD COUNTER, 31 LOAD REGISTER, 30 D6, 29 D5, 28 D4, 27 D3, 26 D2, 25 D1, 24 EQUAL, 23 Vss, 22 SCAN
REGISTER BCD IN
DIGIT OUT
BCD OUT (12)(13)(14)(15) A B C D
SEGMENT OUT (5) (6) (7) (8) (9) (10) (11) a b c d e f g
DIGIT OUT (30)(29)(28)(27)(26)(25) D6 D5 D4 D3 D2 D1
7 SEGMENT DECODER DRIVER
GATE
BLANKING
LZB(4)
MULTIPLEXER
DIGIT COUNTER
SCAN OSC
SCAN(22)
VDD(2)
SET(3)
STORE(16)
6 DIGIT LATCH
COMPARATOR
CARRY(39)
UP/DOWN(41)
COUNT INHIBIT(38)
COUNT(37)
CLEAR(21)
6 DIGIT BCD UP/DOWN COUNTER
6 DIGIT REGISTER
ZERO(40)
6 DIGIT MULTIPLEXER
6 DIGIT MULTIPLEXER
(32) LOAD COUNTER
CA (20) CB (19) CC (18) CD (17) COUNTER BCD IN
Vss (23)
(31) LOAD REGISTER
RA (36) RB (35) RC (34) RD (33) REGISTER BCD IN
Vss (23)

Fig. 4 TS5070P (Counter unit, Q5)

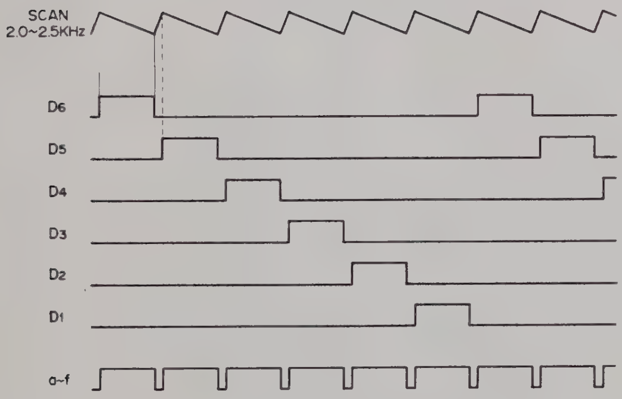
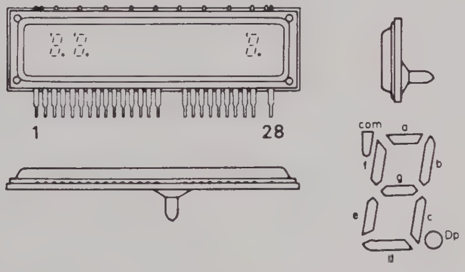


Fig. 5 TC5070P Timing chart



PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CONNECTION	F	N_C	G_9	N_C	N_C	G_8	g	f	G_7	e	d	G_6	N_C	N_C
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	G_5	N_P	N_P	G_4	D_P	G_3	c	b	G_2	a	COM	G_1	N_P	F

Fig. 6 Indicating tube 9-BT-12

Q5 (TC5070P) is a presettable, 6-digit BCD counter which incorporates a 6-digit latch, 6-digit dynamic drive digital counter, and 7-segment decoder/driver. Band information supplied from the RF unit is applied to a diode matrix to preset the 100 kHz, 1 MHz and 10 MHz digits. Preset values are given in **Fig. 3**. For instance, to preset 14.000 MHz, with a 500 kHz counter input signal, the 10 MHz value is preset to 1, 1 MHz to 3, and 100 kHz to 5, and the 500 kHz counter input signal is subtracted from 14.000 MHz. (If no counter input signal were present, 13.500 MHz would be displayed). Q5 supplies the display tube drivers with 7-segment information and dynamic drive control signals to light the fluorescent display tube.

In the counter unit, a diode matrix generates frequency division information and supplies the PLL unit with this information. If the PLL unlocks, a BLK (Blanking Low) signal will be applied to the digit driver IC (Q11) to blank the fluorescent display tube.

CIRCUIT DESCRIPTION

2. IF SHIFT operation

The IF SHIFT circuit shifts the passband of the IF circuit without changing the receiving frequency. The relative position of the passband of the IF filter to the received signal is shifted when the IF SHIFT control is turned as shown in **Fig. 7**. The IF SHIFT circuit block diagram is shown in **Fig. 8**.

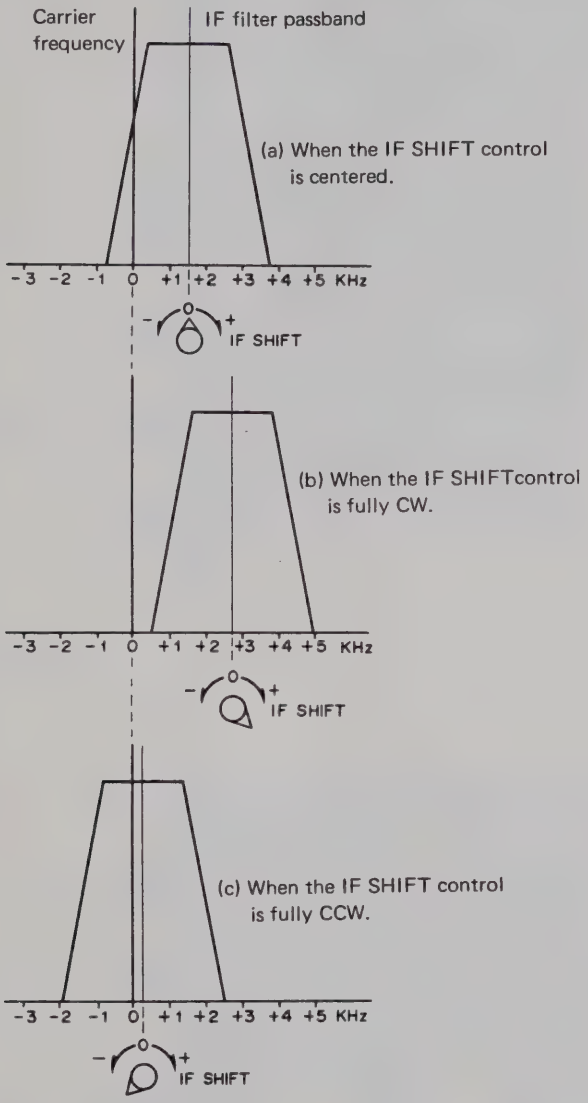

Carrier frequency
IF filter passband
(a) When the IF SHIFT control is centered.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT
(b) When the IF SHIFTcontrol is fully CW.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT
(c) When the IF SHIFT control is fully CCW.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT

Fig. 7 IF SHIFT operation (for USB mode)

Frequencies within the PLL loop satisfy the following relationship.

$$N \cdot 500\ \text{kHz} \fallingdotseq f_{BPF1} - f_{VCO} \qquad (1)$$

where N : divisor of programmable divider

500 kHz : phase reference frequency

f_{BPF1} : input frequency to MIX (1)

f_{VCO} : VCO frequency

For example, in the case of 14 MHz reception, f_{BPF1} is given by eq. (1) as

$$f_{BPF1} = 10\ \text{MHz} + f_{BPF2} \qquad (2)$$

where 10 MHz : band setting frequency

$$f_{BPF2} = f_{VFO} + f_{CAR} \qquad (3)$$

where f_{VFO} : VFO frequency

f_{CAR} : carrier frequency

By substituting eq. (3) into eq.(2) and eq.(2) into eq.(1)

$$f_{VCO} = 10\ \text{MHz} + f_{VFO} + f_{CAR} - N \cdot 500\text{kHz}$$

$$\therefore f_{CAR} = f_{VCO} + (N \cdot 500\ \text{kHz} - 10\ \text{MHz} - f_{VFO})$$

Assuming that f_{VFO} is constant, when f_{CAR} is varied by $\pm \Delta f$,

$$\begin{aligned} f_{CAR} \pm \Delta f &= [f_{VCO} + (N \cdot 500\ \text{kHz} - 10\ \text{MHz} - f_{VFO})] \pm \Delta f \\ &= (f_{VCO} \pm \Delta f) + (N \cdot 500\ \text{kHz} - 10\ \text{MHz} - f_{VFO}) \end{aligned}$$

Thus, f_{VCO} varies by $\pm \Delta f$ as f_{CAR} is varied by $\pm \Delta f$.

The receiving frequency, f_R is given by

$$f_R = f_{VCO} - f_{CAR} \qquad (4)$$

Therefore, when f_{CAR} is shifted by $+\Delta f$, receiving frequency f'_R is given by

$$\begin{aligned} f'_R &= (f_{VCO} + \Delta f) - (f_{CAR} + \Delta f) \\ &= f_{VCO} - f_{CAR} \qquad (5) \end{aligned}$$

From equations (4) and (5),

$$f_R = f'_R$$

Thus the receiving frequency does not vary even if f_{CAR} is varied. However,

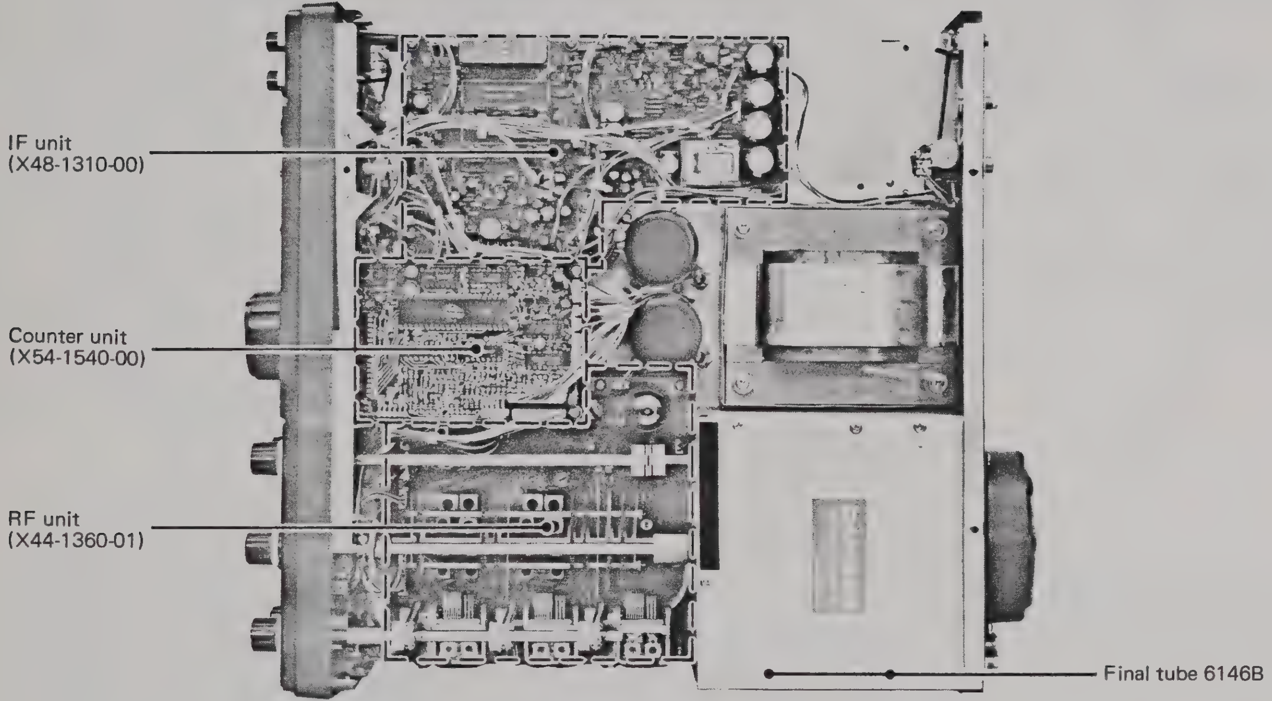
$$f_R = f_{VCO} - \text{IF frequency}$$

so the IF frequency varies as f_{VCO} varies.

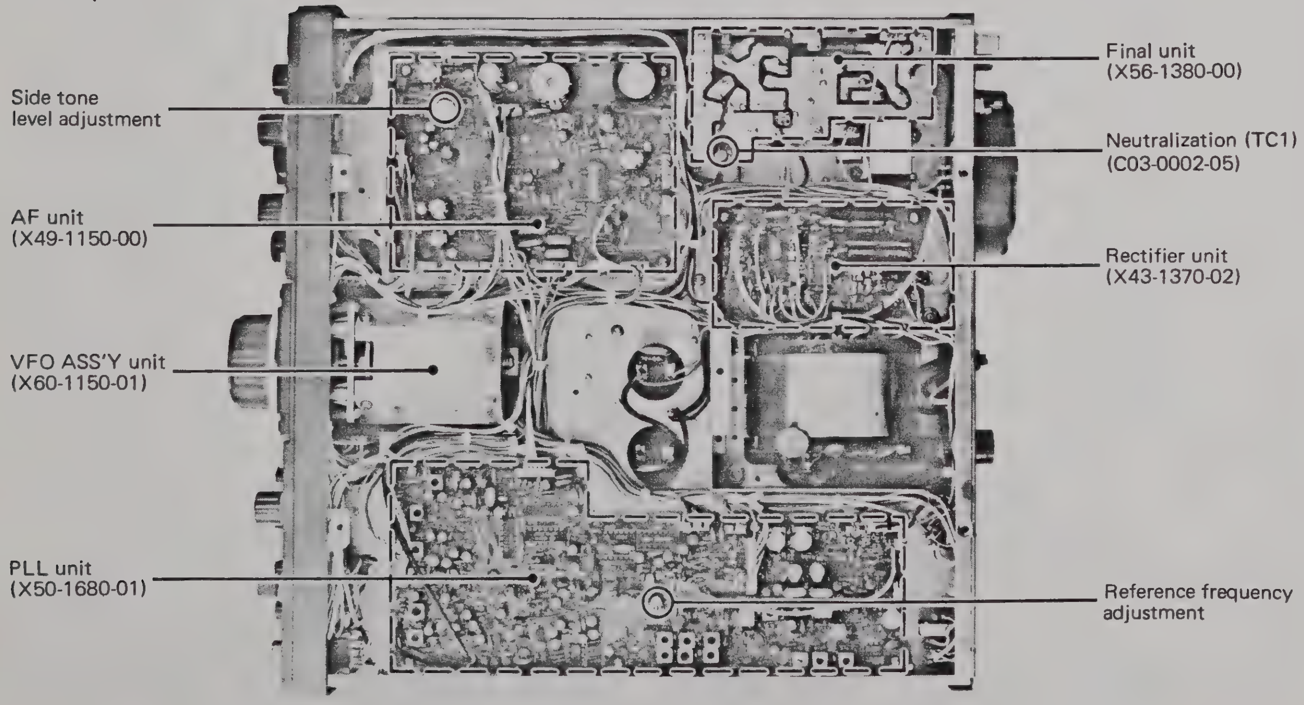
This means that the relative position of the IF filter passband to the carrier position (of the received signal) is shifted by the same amount as the f_{VCO} variation.

INSIDE VIEWS

TOP VIEW

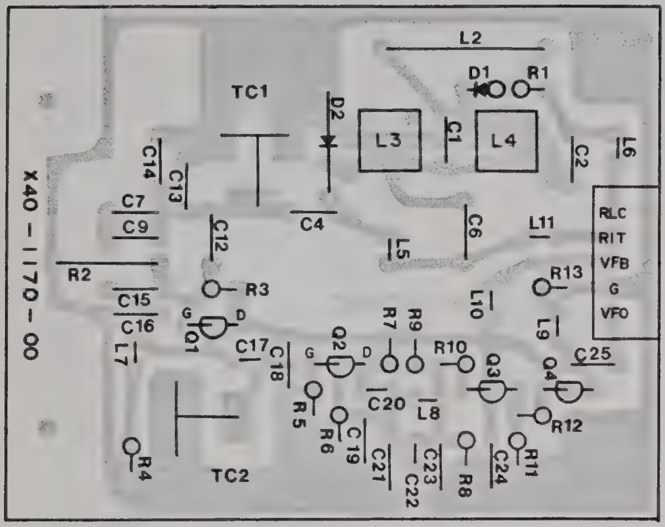


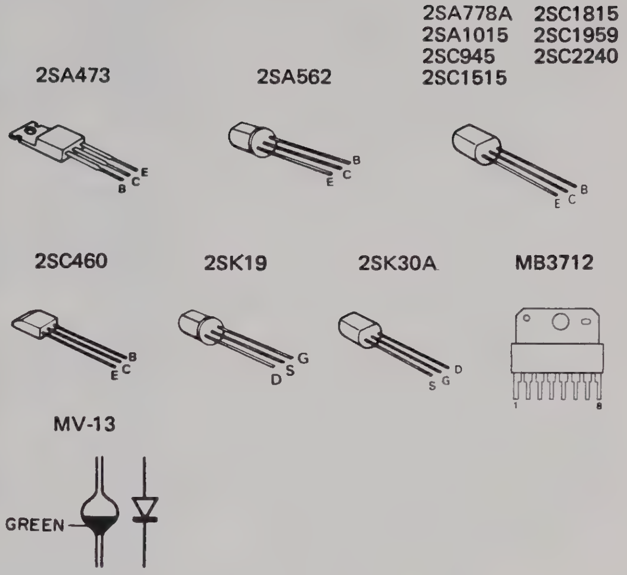
BOTTOM VIEW



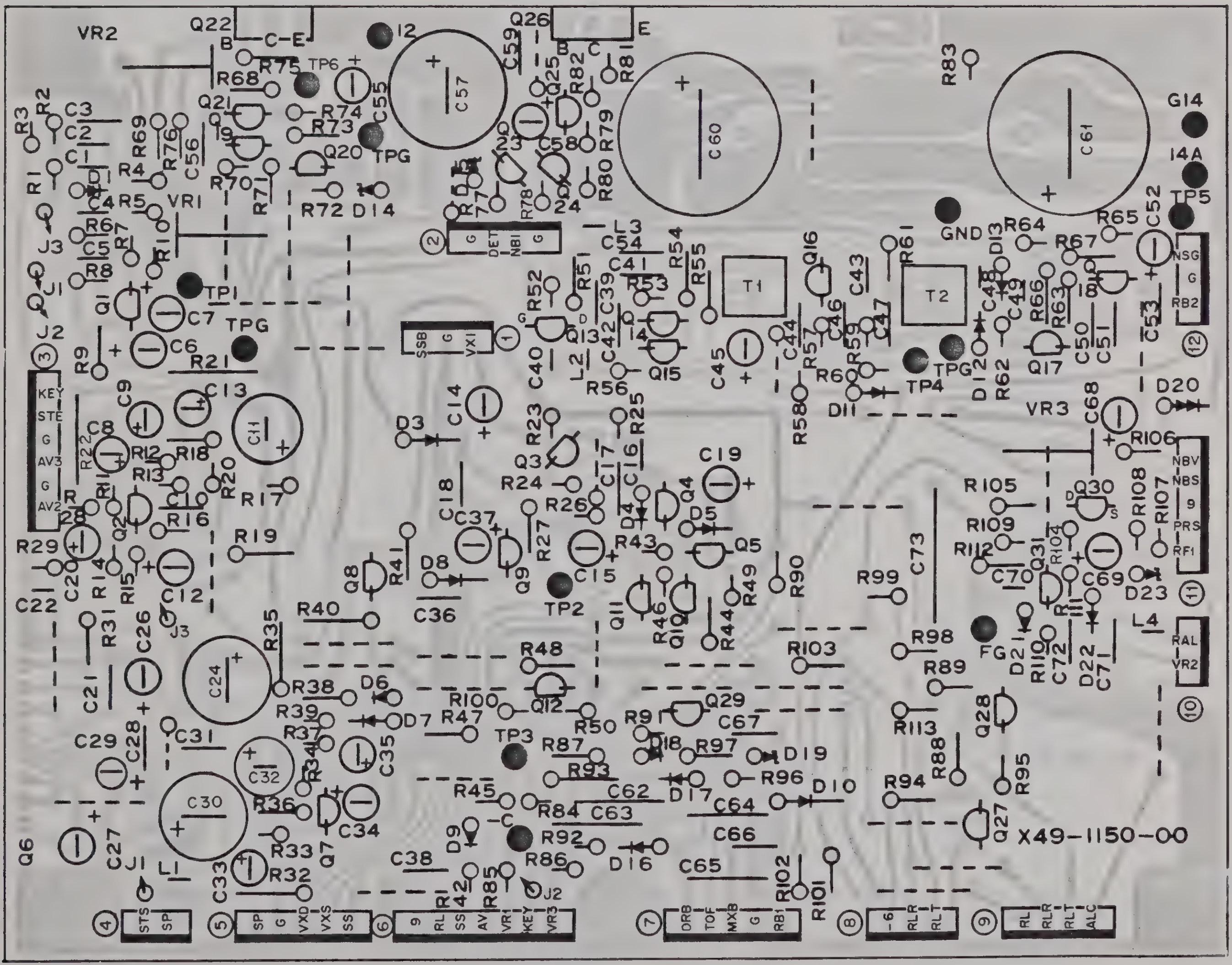
TS-530S PC BOARD VIEWS

▼ VFO UNIT (X40-1170-00) View from component side



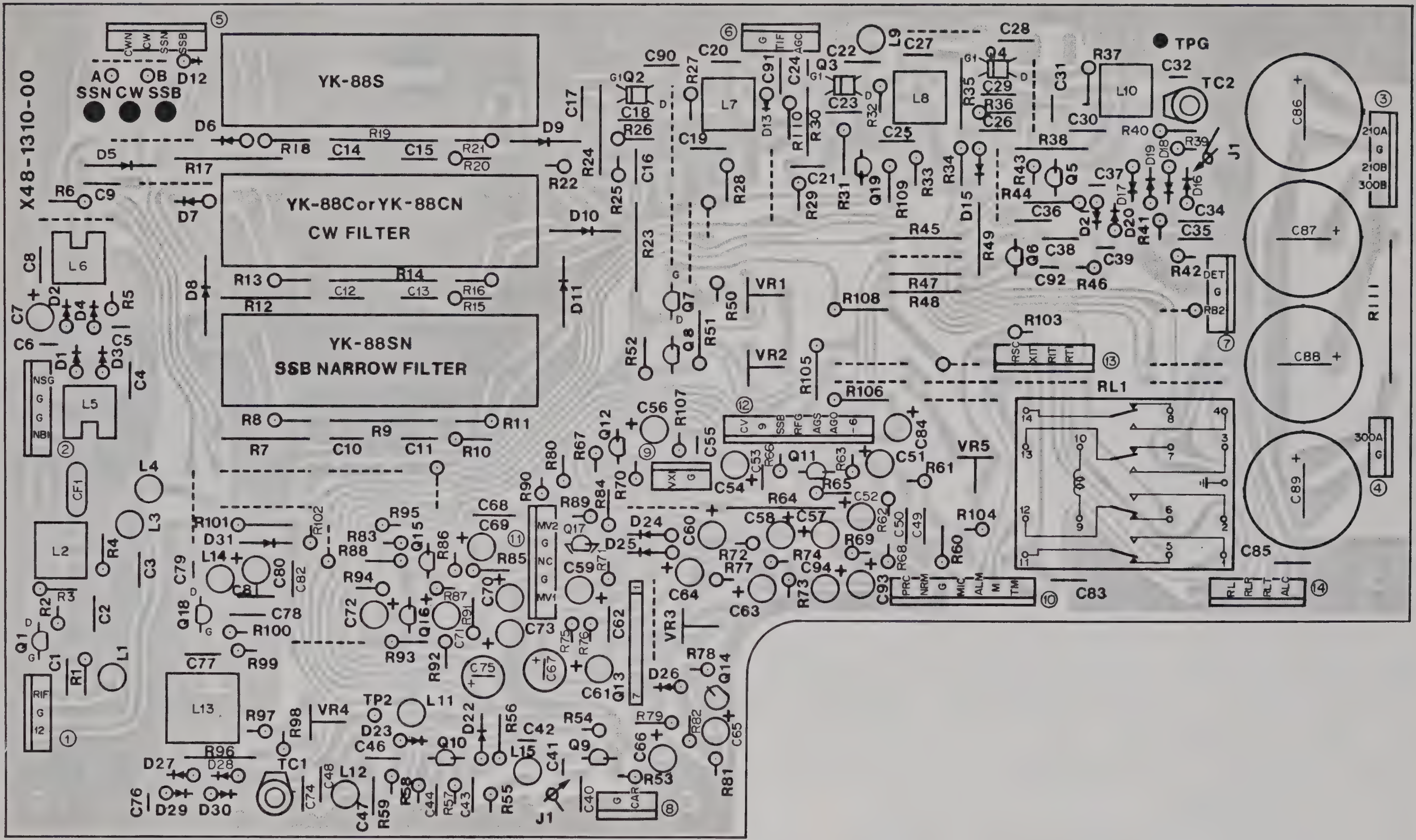


▼ AF UNIT (X49-1150-00) View from component side



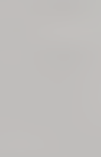
TS-530S PC BOARD VIEW

▼IF UNIT (X48-1310-00)   View from component side

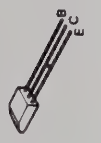


TS-530S PC BOARD VIEW

2SC1675
2SC1775
2SC1885
2SC1923
2SC1959



2SC460



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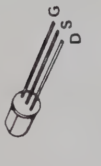
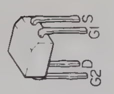
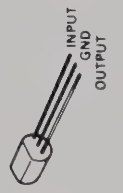
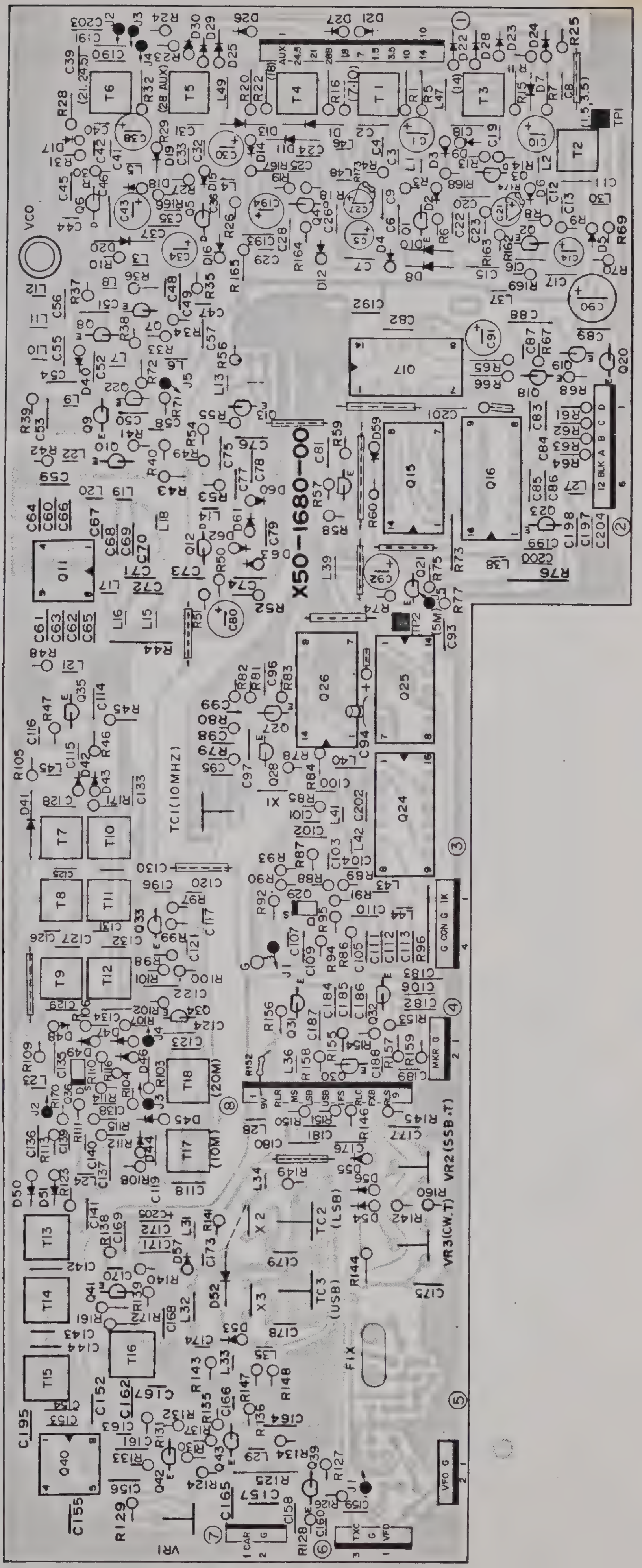


3SK73



NJM78L05A

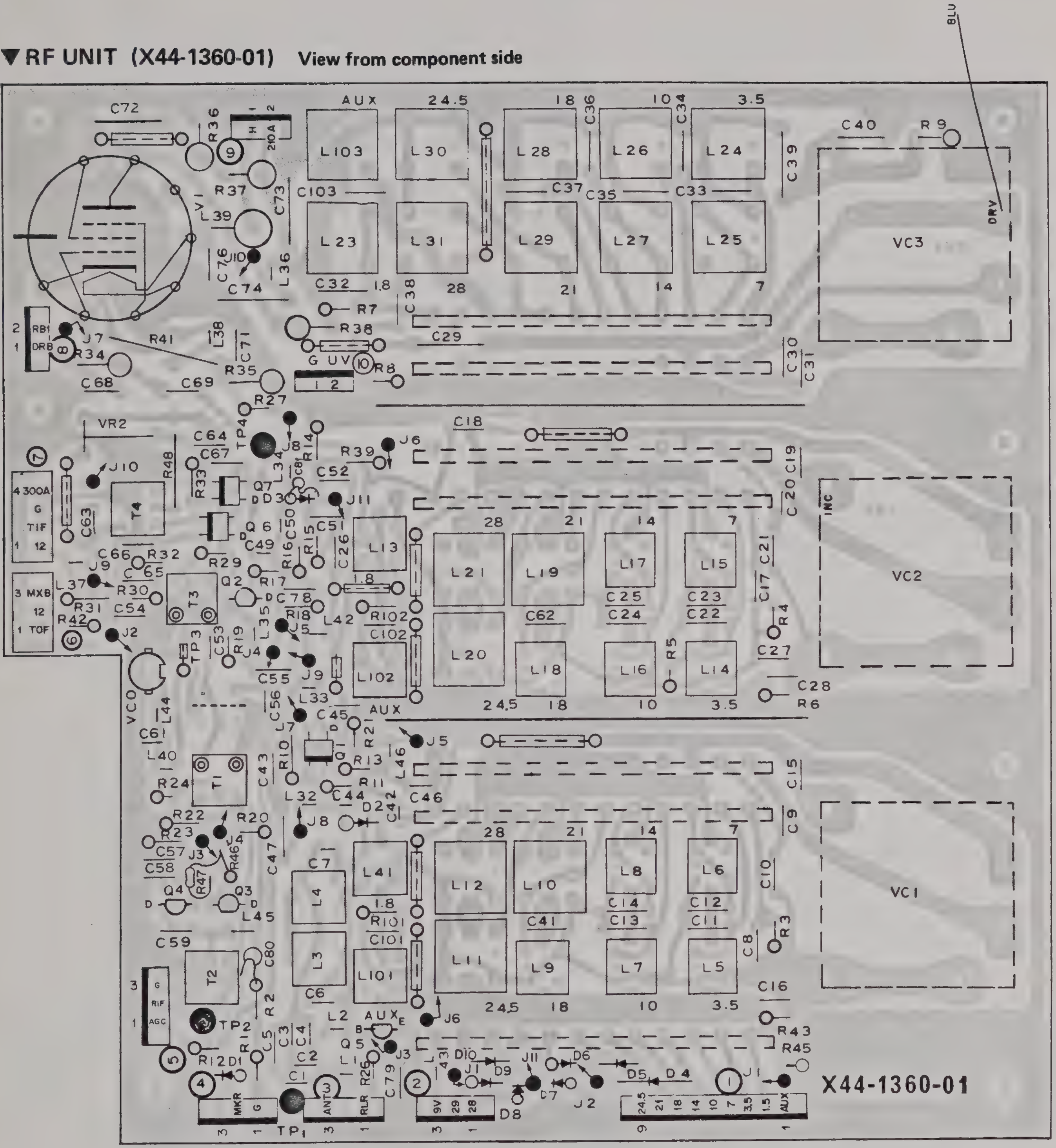




▼ PLL UNIT (X50-1680-01)   View from component side

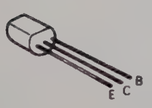
S-530S PC BOARD VIEW

▼RF UNIT (X44-1360-01) View from component side

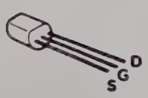


D1, 6, 7 : 3SK73(GR) Q2~4 : 2SK125 Q5 : 2SC1815(Y) D1 : 1S1587 D2, 3 1S2588 D4~10 : 1S1555 V1 : 12BY7A

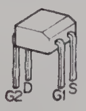
2SC1815



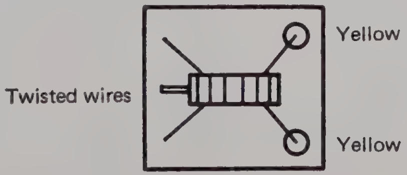
2SK125



3SK73



Attachment method of T1,T2



PARTS LIST

Note 1:
K: U.S.A. T: Britain W: Europe X: Australia

Note 2:
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration. Resistors not otherwise detailed are carbon type (1/4W or 1/8W).
Order carbon resistors and capacitors according to the following example:

A carbon resistor's part number is RD14BY 2E222J.

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

RESISTOR

1. Type of the carbon resistor

RD14BY
RD14BB (small size)

RD14CY
RD14CB (small size)

2. Wattage

1W → 3A 3W → 3F 5W → 3H
2W → 3D 4W → 3G

3. Resistance value

②② ② → means 22 × 10^2 = 2200Ω (2.2 kΩ)

Example: 221 → 220Ω 223 → 22 kΩ 225 → 2.2 MΩ
222 → 2.2 kΩ 224 → 220 kΩ

4. Tolerance

J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

CC	45	TH	1H	220	J
1′	2	3′	4	5	6

Type II

CK	45	F	1H	103	Z
1	2	3	4	5	6

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ..... round, square, etc.
3 = Temp range
3′ = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

3′ = CC45 ○ ○ ...
Ceramic capacitor (type I) temperature coeff. capacitor 1′ 3′.

1st word (Color)	C (Black)	L (Red)	P (Orange)	R (Yellow)	S (Green)	T (Blue)	U (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

Ex. CC45TH = −470 ±60 ppm/°C

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

3 = CK45 ○
Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

5 = Capacitor value

Example: 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001 μF
103 → 0.01 μF

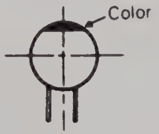
6 = Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10 μF −10 ~ +50 Less than 4.7 μF −10 ~ +75

Less than 10 pF

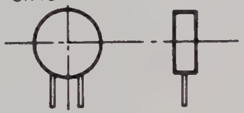
Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

CC45



Type I

CK45



Type II

Abbreviation		Abbreviation	
Cap.	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

TS-530 SEMICONDUCTOR

☆: New parts

Item	Name	Parts No.	Remarks
Diode	1N60	V11-0051-05	
	1S1007	V11-4160-66	
	1S1555	V11-0076-05	
	1S1587	V11-0370-05	
	1S2588	V11-0414-05	
	V03C	V11-0290-05 200V 1.3A	
	V06B	V11-0219-05 100V 1.1A	
	V06E	V11-0285-05 400V 1.1A	
	V08J	V11-0282-05 800V 1.1A	
Varistor	MV-13	V21-0004-05	

Item	Name	Parts No.	Remarks
Vari-cap diode	1SV53A	V11-4161-36	
	1SV54GC	V11-4173-46	☆
LED	SLP-144	V11-6172-76	
	TLR-205	V11-3162-96	
Zener diode	WZ-061	V11-0243-05	
	WZ-090	V11-0240-05	
	WZ-110	V11-4161-46	
	XZ-055	V11-4105-50	
	XZ-060	V11-4101-20	
	XZ-090	V11-4167-06	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
	E22-0207-05	Lug plate	
	E22-0472-05	Lug plate Final	☆
	E23-0046-04	Square terminal Switch, Relay	
	E30-0181-05	AC cord UL/CSA K, M	
	E30-0185-05	AC cord SAA X	
	E30-0585-05	AC cord CEE W	
	E30-0602-05	AC cord 3P T	
	E31-2086-05	Coax cable with plug	
	E90-0004-15	Plate cap	
	F05-4022-05	Fuse 4A W, T, X, M	
	F05-6021-05	Fuse 6A K, M	
	F09-0041-05	Fan	
	G01-0801-04	Gnd spring	
	G09-0410-05	D spring φ6	
	G13-0633-14	Cushion Meter	
	G13-0639-04	Cushion Indicating tube	
	G53-0502-04	Packing Case side	
	G53-0512-04	Packing Panel	
	H01-2741-04	Carton case (inside) K, W, X, M	☆
	H01-2742-04	Carton case (inside) T	☆
	H03-1797-04	Carton case (outside)	☆
	H10-2539-02	Packing fixture (F)	
	H10-2540-02	Packing fixture (R)	
	H20-0439-03	Protective cover	
	H25-0120-04	Protective bag	
	J02-0022-05	Foot (small)	
	J02-0049-14	Foot (large)	
	J13-0033-15	Fuse holder	
	J25-3015-04	PC board Relay	☆
	J32-0029-04	Hex. boss Relay, PLL	
	J32-0159-04	Hex. boss Final	
	J41-0006-05	Cord bushing K, M	
	J41-0024-15	Cord bushing W, T, X	
	J42-0409-04	Knob bushing +0.5 SHIFT	
	J61-0019-05	Vinyle tie	
	J61-0401-05	Nylon band	
	J61-0402-05	Free up belt W	
	K01-0406-05	Handle	☆
	K21-0723-04	Pointer knob BAND	
	K23-0738-04	Knob 1 METER, AGC	
	K23-0745-04	Knob VOX, NB, CAR	☆
	K27-0414-04	Push knob	
	K29-0713-04	Push knob +0.5 SHIFT	
	K29-0715-04	Pointer knob MODE	
	K29-0737-04	Knob 5 PLATE	
	K29-0738-04	Knob 6	
	K29-0744-04	Paddle knob STBY	☆
L1	L40-6891-13	Choke coil 6.8μH	
L2	L33-0635-05	Final choke	
L3	L34-1004-05	Final coil B 28 MHz	
L4	L34-0560-25	Final coil A	
L5	L33-0259-05	Choke coil 470μH	
T1	L01-8106-15	Power trans	
PS1,2	L39-0046-05	PS coil PLATE	
	N09-0256-05	Gnd screw	

Ref. No.	Parts No.	Description	Re-marks
	N14-0115-05	Flange nut GND	
	N14-0509-05	Wing nut GND	
	N14-0517-05	Cap nut BIAS	
	N30-4012-46	Round screw Foot (large)	
	N30-4016-46	Round screw GND	
	N30-4025-46	Round screw Foot (accessory)	
	N33-3006-41	Round flat screw SP	
	N35-3008-45	Bind screw Foot (small)	
	N35-4006-41	Bind screw Case	
	N87-4012-46	Self tapping screw Foot (large)	
	N89-3006-46	Bind tapping screw Final cover	
	N99-0306-04	Hex. head screw VFO	
R22	RC05GF2H221J	Solid 220Ω 1/2W	
R24	RC05GF3A103K	Solid 10kΩ 1W	
R25,26	RC05GF2H474J	Solid 470kΩ 1/2W	
R28	RC05GF2H330J	Solid 33Ω 1/2W	
VR1	R01-3414-05	Pot. 10kΩ(A) AF	☆
VR2	R01-3415-05	Pot. 10kΩ(B) RF	☆
VR3	R01-3417-05	Pot. 10kΩ(F) IF SHIFT	☆
VR4	R01-2405-05	Pot. 5kΩ(B) RIT/XIT	
VR5	R01-3414-05	Pot. 10kΩ(A) MIC	☆
VR6	R01-3416-05	Pot. 10kΩ(B) CAR	☆
VR7	R01-4408-05	Pot. 50kΩ(B) VOX GAIN	☆
VR8	R01-0404-05	Pot. 300Ω(B) NB	
VR9	R01-6401-05	Pot. 250kΩ(B) DELAY	
VR10	R01-0405-05	Pot. 300Ω(B) ANTI	☆
VR11,12	R01-3411-05	Pot. 10kΩ(B) RF OUT, BIAS	
S1~6	S40-2419-05	Push switch PC board type	
S7	S40-2403-05	Push switch +0.5 SHIFT	
S8,9	S36-1403-05	See saw switch HEATER, POWER	☆
S11	S01-1423-05	Rotary switch AGC	
S13	S01-1427-05	Rotary switch METER	☆
S14,16	S40-2415-05	Push switch Lead type	
S17	S33-2403-05	Paddle switch STBY	☆
S18	S01-2429-05	Rotary switch MODE	☆
S20	S31-2007-05	Slide switch SG	
S22	S01-3406-05	Rotary switch FINAL	
S23	S31-2027-05	Slide switch AC volt W,T,X,M	
RL1	S51-2407-05	Relay	
	T07-0215-05	Speaker	☆
	T40-0022-05	Motor FAN	
	X43-1370-02	Rectifier unit	☆
	X44-1360-01	RF unit	☆
	X48-1310-00	IF unit	☆
	X49-1150-00	AF unit	☆
	X50-1680-01	PLL unit	☆
	X54-1540-00	Counter unit	
	X56-1380-00	Final unit	
	X60-1150-01	VFO ass'y unit	☆

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
L44	L40-2282-01	Ferri-inductor 0.22µH	
L45,46	L40-1511-03	Ferri-inductor 150µH	
T1	L19-0303-05	Wide bandwidth trans	
T2	L30-0509-05	IFT	
T3	L19-0303-05	Wide bandwidth trans	
T4	L30-0509-05	IFT	
R34	RC05GF2H104J	Solid 100kΩ 1/2W	
R35	RC05GF2H151J	Solid 150Ω 1/2W	
R36	RC05GF2H104J	Solid 100kΩ 1/2W	
R37	RS14AB3A332J	Metal film 3.3kΩ 1W	
R38	RC05GF2H474J	Solid 470kΩ 1/2W	
VR2	R12-6404-05	Trim. pot 470kΩ	
	R92-0150-05	Short jumper	
	S29-7401-05	Rotary wafer ass'y	

IF UNIT (X48-1310-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0457-05	C 0.022µF	
C5,6	CC45SL1H470J	C 47pF	
C7	CE04W1C100M	E 10µF 16V	
C9~15	C91-0457-05	C 0.022µF	
C18	C91-0456-05	C 0.047µF	
C19	C91-0457-05	C 0.022µF	
C20	CC45SL1H100D	C 10pF ±0.5pF	
C23	C91-0457-05	C 0.022µF	
C24	CC45SL1H100D	C 10pF ±0.5pF	
C25	C91-0457-05	C 0.022µF	
C26	C91-0456-05	C 0.047µF	
C27	CC45SL1H470J	C 47pF	
C28	C91-0456-05	C 0.047µF	
C29	C91-0457-05	C 0.022µF	
C30	C91-0456-05	C 0.047µF	
C31	CC45SL1H100D	C 10pF ±0.5pF	
C32	CC45UJ1H070D	C 7pF ±0.5pF	
C35	CQ92M1H333K	ML 0.033µF	
C36	C91-0456-05	C 0.047µF	
C37	CC45SL1H470J	C 47pF	
C38	C91-0457-05	C 0.022µF	
C40	C91-0456-05	C 0.047µF	
C44,47	CC45SL1H470J	C 47pF	
C49,50	CC45SL1H101J	C 100pF	
C51	CE04W1H010M	E 1µF 50V	
C52	CE04W1C100M	E 10µF 16V	
C53	CQ92M1H153K	ML 0.015µF	
C54,56~58	CE04W1H010M	E 1µF 50V	
C59	CE04W1H3R3M	E 3.3µF 50V	
C60,61,63	CE04W1H010M	E 1µF 50V	
C64	CE04W1H4R7M	E 4.7µF 50V	
C65	CE04W1C100M	E 10µF 16V	
C66	CE04W1H4R7M	E 4.7µF 50V	
C67	CE04W1A221M	E 220µF 10V	
C68	CQ92M1H473K	ML 0.047µF	
C69	CE04W1A470M	E 47µF 10V	
C70	CE04W1C100M	E 10µF 16V	
C71	CE04W1H010M	E 1µF 50V	
C72	CE04W1H3R3M	E 3.3µF 50V	
C73	CE04W1H010M	E 1µF 50V	
C74	C91-0457-05	C 0.022µF	
C75	CE04W1A221M	E 220µF 10V	
C76	CC45UJ1H100D	C 10pF ±0.5pF	
C77	CC45SL1H101J	C 100pF	
C78	C91-0457-05	C 0.022µF	
C79	CC45CH1H050C	C 5pF ±0.25pF	
C80	CE04W1C220M	E 22µF 16V	
C84	CE04W1H010M	E 1µF 50V	
C85	C91-0456-05	C 0.047µF	
C86~89	CE04W2V220	E 22µF 350V	
C91,92	CC45SL1H470J	C 47pF	
C93,94	CE04W1C100M	E 10µF 16V	
TC1,2	C05-0030-15	Ceramic trimmer 20pF	
	E23-0401-05	Round terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0573-05	Mini connect wafer 5P	
	E40-0773-05	Mini connect wafer 7P	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-1511-03	Ferri-inductor 150µH	
L2	L34-0940-05	Tuning coil	
L3,4	L40-1511-03	Ferri-inductor 150µH	
L5	L34-0942-05	Tuning coil	
L6	L34-0997-05	Tuning coil	
L7,8	L34-0535-05	Tuning coil	
L9	L40-1511-03	Ferri-inductor 150µH	
L10	L34-0536-05	Tuning coil	
L11,12	L40-1511-03	Ferri-inductor 150µH	
L13	L34-0567-05	Tuning coil BM	
L14	L40-4711-03	Ferri-inductor 470µH	
L15	L40-1511-03	Ferri-inductor 150µH	
CF1	L72-0324-05	Ceramic filter 8.83MHz NB	☆
XF1	L71-0208-05	MCF YK-88S	
R111	RS14GB3D471J	Metal film 470Ω 2W	
VR1	R12-3045-05	Trim. pot 10kΩ	
VR2	R12-6401-05	Trim. pot 470kΩ	
VR3	R12-5030-05	Trim. pot 100kΩ	
VR4	R12-0401-05	Trim. pot 100Ω	
VR5	R12-3045-05	Trim. pot 10kΩ	
	R92-0150-05	Short jumper	
RL1	S51-4401-05	Relay LZN-4	

AF UNIT (X49-1150-00)

Ref. No.	Parts No.	Description	Re-marks
C1,2	CQ92M1H123K	ML 0.012µF	
C3	CQ92M1H223K	ML 0.022µF	
C4,5	CQ92M1H123K	ML 0.012µF	
C6	CE04W1C100M	E 10µF 16V	
C7	CE04W1H010M	E 1µF 50V	
C8	CE04W1HR10M	E 0.1µF 50V	
C9	CE04W1C100M	E 10µF 16V	
C10	CQ92M1H103K	ML 0.01µF	
C11	CE04W1A101M	E 100µF 10V	
C12	CE04W1HR47M	E 0.47µF 50V	

PARTS LIST

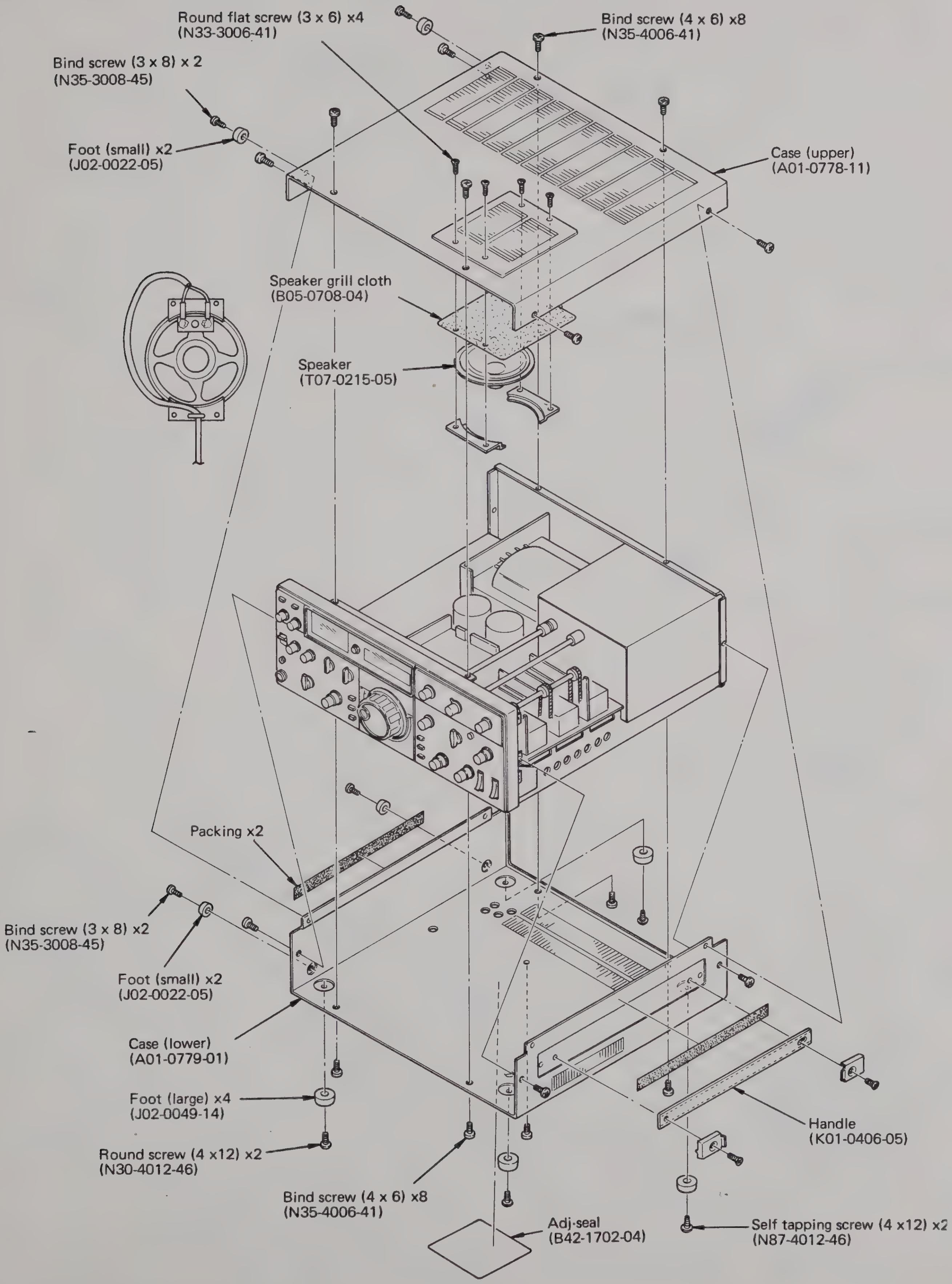
Ref. No.	Parts No.	Description	Re-marks
C113	CC45SL1H101J	C 100pF	
C115	CC45RH1H100D	C 10pF ±0.5pF	
C116	CC45TH1H050C	C 5pF ±0.25pF	
C117	CC45CH1H010C	C 1pF ±0.25pF	
C118	CC45RH1H560J	C 56pF	
C120	CC45CH1H020C	C 2pF ±0.25pF	
C121	CC45SL1H470J	C 47pF	
C123	CC45RH1H390J	C 39pF	
C125	CC45TH1H330J	C 33pF	
C126	CC45TH1H150J	C 15pF	
C127	CC45TH1H330J	C 33pF	
C130	CC45UJ1H150J	C 15pF	
C131	CC45UJ1H050C	C 5pF ±0.25pF	
C132	CC45UJ1H150J	C 15pF	
C139	CC45SL1H100D	C 10pF ±0.5pF	
C140	CC45RH1H220J	C 22pF	
C142	CC45RH1H470J	C 47pF	
C143	CC45RH1H220J	C 22pF	
C144	CC45RH1H470J	C 47pF	
C159	CC45SL1H330J	C 33pF	
C160	CC45SL1H100D	C 10pF ±0.5pF	
C162	CC45CH1H010C	C 1pF ±0.25pF	
C163	CC45SL1H150J	C 15pF	
C166	CC45SL1H100D	C 10pF ±0.5pF	
C167	CC45CH1H020C	C 2pF ±0.25pF	
C169	CC45SL1H101J	C 100pF	
C172	C91-0456-05	C 0.047μF	
C173	CC45CH1H010C	C 1pF ±0.25pF	
C174	CC45UJ1H680J	C 68pF	
C178,179	CC45SL1H220J	C 22pF	
C182,183	C91-0456-05	C 0.047μF	
C184	CC45CH1H270J	C 27pF	
C185	CC45CH1H390J	C 39pF	
C186	CC45CH1H101J	C 100pF	
C187	CC45SL1H221J	C 220pF	
C188	CC45SL1H220J	C 22pF	
C189	CC45SL1H050C	C 5pF ±0.25pF	
C194	CE04W1A470M	E 47μF 10V	
C196	CC45SL1H100D	C 10pF ±0.5pF	
C197~202	C91-0456-05	C 0.047μF	
C205	CE04W1HR47M	E 0.47μF 50V	
TC1	C05-0029-15	Ceramic trimmer 50pF	
TC2,3	C05-0056-05	Ceramic trimmer 30pF	
	E04-0154-05	Coax connector	
	E23-0046-04	Square terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0673-05	Mini connect wafer 6P	
	E40-0973-05	Mini connect wafer 9P	
	E40-1073-05	Mini connect wafer 10P	
L1~7	L40-1511-03	Ferri-inductor 150μH	
L8	L40-4701-03	Ferri-inductor 47μH	
L9	L40-1592-02	Ferri-inductor 1.5μH	
L10	L40-1092-02	Ferri-inductor 1μH	
L11	L40-1292-02	Ferri-inductor 1.2μH	
L12	L40-1892-02	Ferri-inductor 1.8μH	
L13,14	L40-4711-03	Ferri-inductor 470μH	
L15,16	L40-8201-03	Ferri-inductor 82μH	
L17	L40-1511-03	Ferri-inductor 150μH	
L18~20	L40-2701-03	Ferri-inductor 27μH	
L21~24,27~30	L40-1511-03	Ferri-inductor 150μH	

Ref. No.	Parts No.	Description	Re-marks
L31	L40-2211-03	Ferri-inductor 220μH	
L32	L33-0636-05	Choke coil 20μH	
L33~36	L40-1511-03	Ferri-inductor 150μH	
L37	L40-4711-03	Ferri-inductor 470μH	
L38,39	L40-1511-03	Ferri-inductor 150μH	
L40	L40-4711-03	Ferri-inductor 470μH	
L41,42	L40-4701-03	Ferri-inductor 47μH	
L43,44	L40-2211-03	Ferri-inductor 220μH	
L45~49	L40-1511-03	Ferri-inductor 150μH	
T1	L32-0195-05	OSC coil 7, 10 MHz	
T2	L32-0193-05	OSC coil 1.5, 3.5 MHz	
T3	L32-0196-05	OSC coil 14 MHz	
T4	L32-0199-05	OSC coil 18 MHz	
T5	L32-0198-05	OSC coil 28 MHz	
T6	L32-0197-05	OSC coil 21, 24.5 MHz	
T7	L34-0714-05	Tuning coil	
T8	L34-0715-05	Tuning coil	
T9	L34-0716-05	Tuning coil	
T10	L34-0717-05	Tuning coil	
T11	L34-0718-05	Tuning coil	
T12	L34-0757-05	Tuning coil	
T13	L34-0711-05	Tuning coil	
T14	L34-0713-15	Tuning coil	
T15	L34-0712-05	Tuning coil	
T16	L32-0201-05	OSC coil 8.83 MHz	
T17	L34-0709-05	Tuning coil 10 MHz	
T18	L34-0710-05	Tuning coil 20 MHz	
X1	L77-0482-05	Crystal 10 MHz	
X2	L77-0486-05	Crystal 8.8285 MHz	
X3	L77-0485-05	Crystal 8.8315 MHz	
VR1	R12-5030-05	Trim. pot 100kΩ	
VR2,3	R12-1040-05	Trim. pot 4.7kΩ	
	R92-0150-05	Short jumper	

COUNTER UNIT (X54-1540-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0456-05	C 0.047μF	
C3	C91-0457-05	C 0.022μF	
C4	CC45SL1H150J	C 15pF	
C6	CE04W1A470Q	E 47μF 10V	
C7	CE04W1A101Q	E 100μF 10V	
C8,9	C91-0456-05	C 0.047μF	
C11	CE04W1C101M	E 100μF 16V	
C12	CE04W1V100Q	E 10μF 35V	
C13	CQ92M1H103K	ML 0.01μF 50V	
C14~16	CE04W1V100Q	E 10μF 35V	
C17,18	C91-0456-05	C 0.047μF	
C19	CQ92M1H103K	ML 0.01μF 50V	
C21,22	CC45SL1H050C	C 5pF ±0.25pF	
C23	CE04W1A330Q	E 33μF 10V	
C24~26	C91-0456-05	C 0.047μF	
C28	CE04W1H100M	E 10μF 50V	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-4711-03	Ferri-inductor 470μH	
L2	L40-1011-04	Ferri-inductor 100μH	
L3	L40-2211-03	Ferri-inductor 220μH	
L4	L40-1511-03	Ferri-inductor 150μH	

DISASSEMBLY



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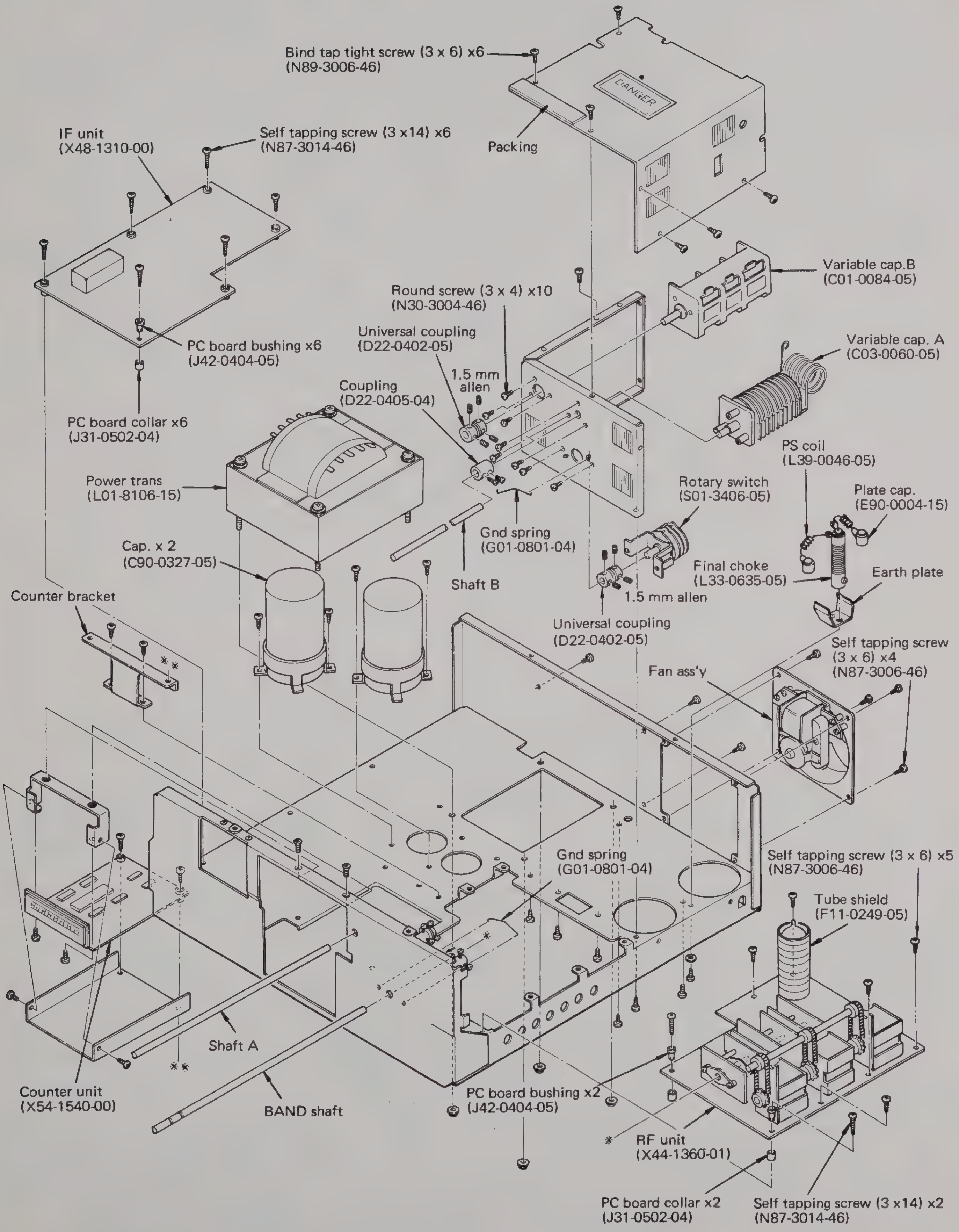

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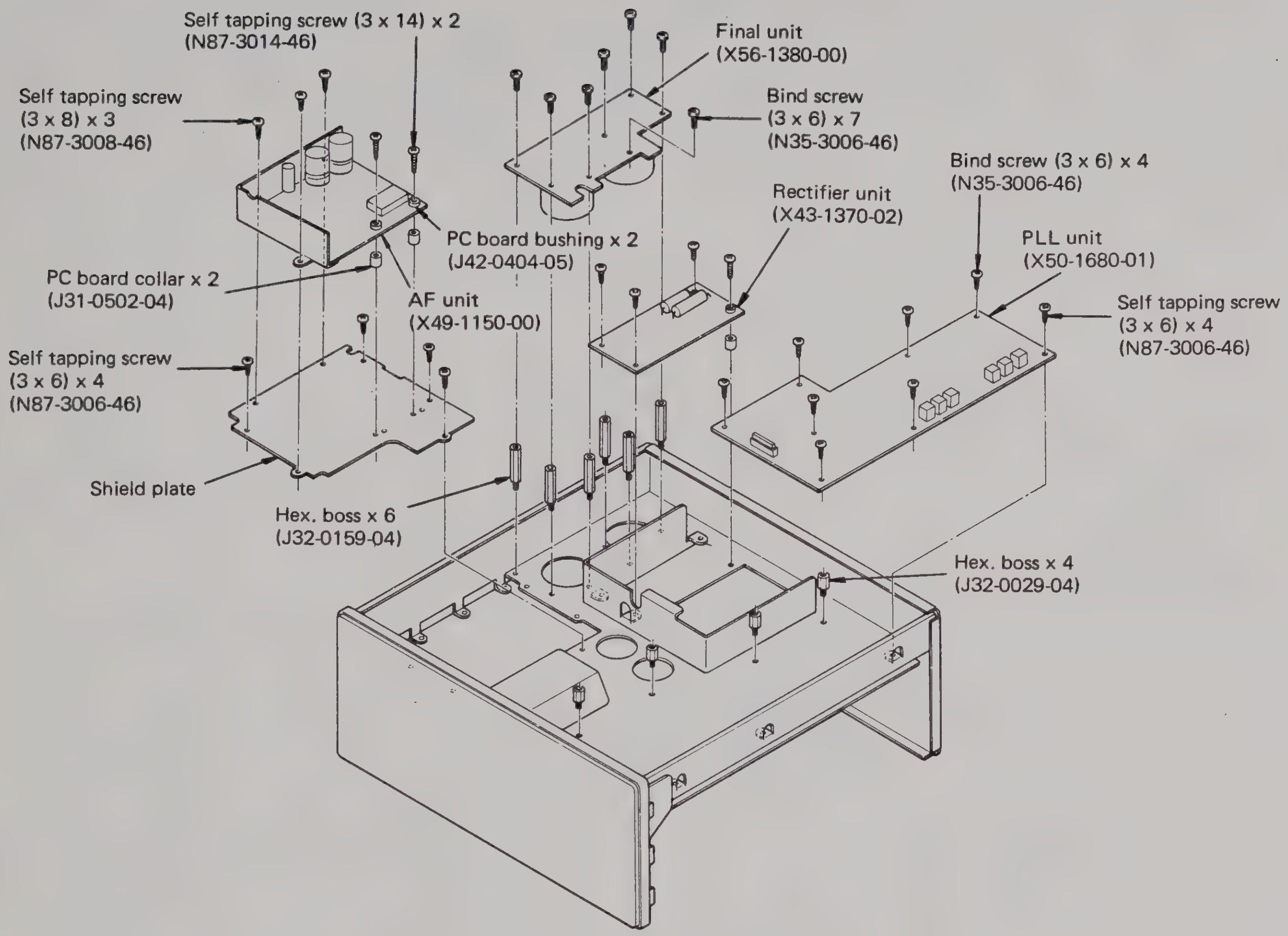
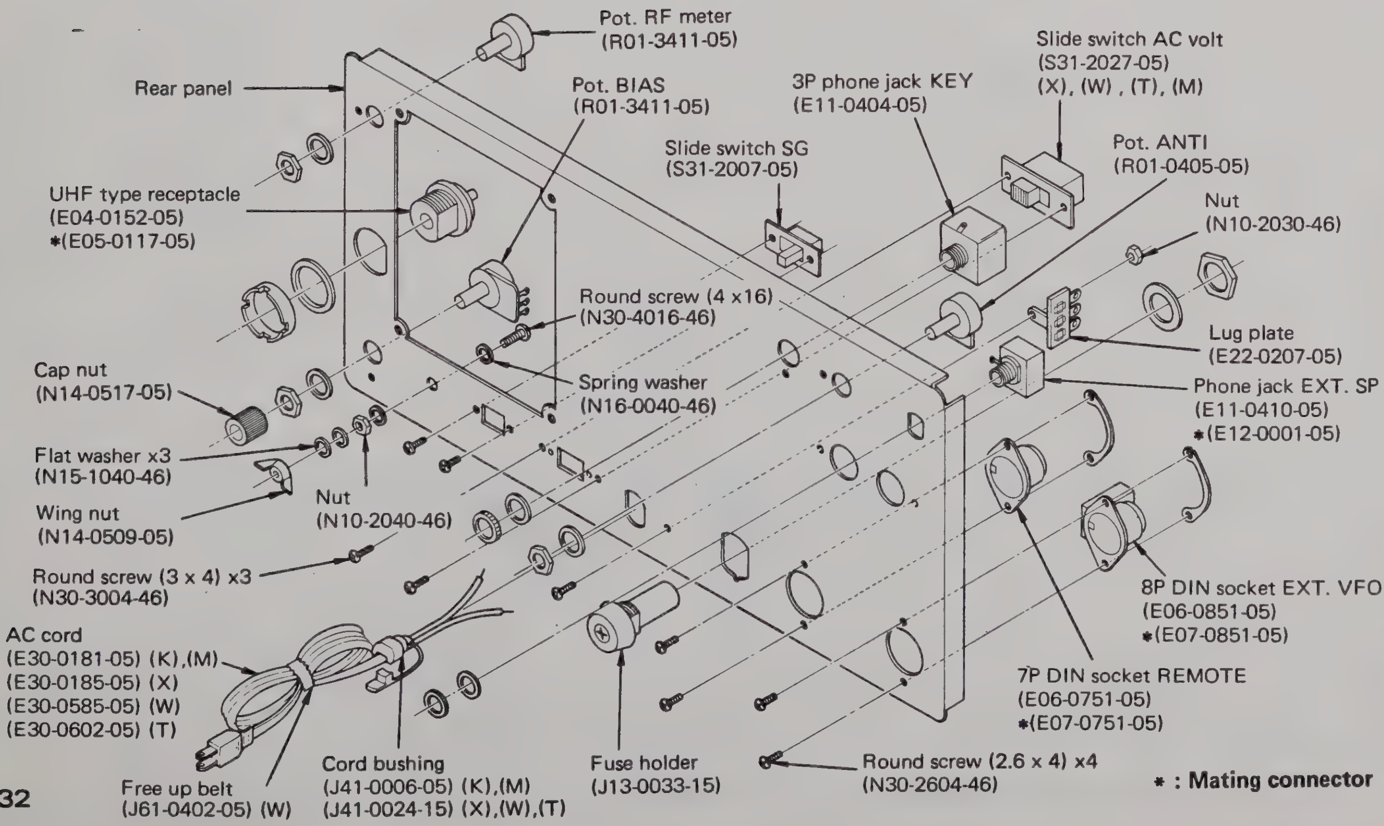


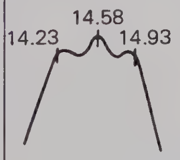


*** : Mating connector**

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. 9V AVR and 3.2V adjustment		DVM	AF	TP-6 Pin-5, connector ⑪	AF	VR2	9V	9V±0.05V	
						VR3	3.2V	3.2V±0.05V	RF1 (FET bias)
2. Base current adjustment	SG SW : ON MODE: USB METER : IP HEATER : ON DRIVE : Fully clockwise STBY : SEND BIAS pot. : Adjust	1P meter			Rear panel	Bias pot.		Set to 60mA	
	STBY REC, SG SW OFF								
3. Carrier adjustment①	IF SHIFT : Centered MODE : USB	RF VTVM	IF	Pin1, connector ⑧	PLL	NOTE : T16	0.3V	0.3V±1 dB	NOTE : The slug of T16 should be turned counter clockwise for this adjustment after the peak point is determined.
	MODE : LSB STBY : REC ↕ SEND	F. counter				VR2	Obtain the same frequency for both transmission and reception	±20 Hz	
	STBY : REC					TC2	8828.50 kHz		
	MODE : USB					TC3	8831.50 kHz		
	MODE : CW STBY : SEND					VR3	8830.70 kHz		
	STBY : REC								
4. IF SHIFT check	MODE : LSB Rotate the IF SHIFT and check the variation	F. counter	IF	Pin 1, connector ⑧				Set IF SHIFT to center. More than + 1.1 kHz , Less than −1.1 kHz.	
	MODE : USB Same as above								
	STBY : SEND Regardless of the IF SHIFT setting							8831.50 kHz	USB
								8828.50 kHz	LSB
	STBY : REC								
5. VFO, RIT check and adjustment	Scale 0~500							Should rotate smoothly and have no abnormal noise.	
	Rear panel SG SW OFF VFO : 250	RF VTVM	PLL	Pin 1, connector ⑥ 2P(GND)	Adjust if the voltage is out of specification. VFO	TC2	200mV	200 mV±1 dB	
	MODE : CW STBY : SEND	F. counter	Rear panel	EXT VFO 1P, 7P (GND)		Adjust if the frequency is out of specification.	800 Hz UP	800±50 Hz	CW SHIFT

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	RIT OFF								
6. Reference oscillator adjustment		F. counter	PLL	TP2	PLL	TC1	1000.000 kHz		
7. VCO adjustment and check	Check the frequencies at the following points and adjust coils until those given in brackets are obtained.	F. counter DVM	PLL PLL	D40 TP1					
	Check the level at each of the above points.	RF VTVM	RF	TP3				$1V\,^{+3}_{-2}$ dB	
PLL lock range	Both edges of the VFO frequency in each band.							Display should indicate.	
8. BPF-A	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D24 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the sweep generator RF output to the EXT-VFO connector.	Sweep generator Oscilloscope	PLL	Q35 Ⓔ	PLL	T13 T14 T15	Adjust until the response shown to the right is obtained.		

VFO / BAND	0	250	500	Adjusting point	
				Unit	Part
1.5	10.33 MHz	10.58 MHz (4.0V)	10.83 MHz	PLL	T2
3.5	12.33	12.58	12.83		
7	15.83	16.08 (4.75V)	16.33		T1
10	18.83	19.08	19.33		
14	22.83	23.08 (4.5V)	23.33		T3
18	26.83	27.08 (5.0V)	27.33		T4
21	29.83	30.08 (3.5V)	30.33		T6
24.5	33.33	33.58	33.83		
28	36.83	37.08	37.33		T5
28.5	37.33	37.58	37.83 (4.75V)		
29	37.83	38.08	38.33		
29.5	38.33	38.58	38.83		

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
13. Coil pack adjustment	Connect the SSG (40dB) to the ANT terminal DRIVE : 12:00 While adjusting, gradually decrease the SSG output level down to –6 dB. Adjust at the following points:	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil RF coil	Max. audio output		
14. Drive coil adjustment	CAL : ON CAR VR : optinum level METER : ALC HEATER : ON MODE : CW SG SW : OFF ANT : 50Ω dummy should be connected. Connect pin 2 to pin 4, connector ⑦ on the AF unit with a clip lead. Receive the marker frequency in the following bands and obtain the peak level by adjusting the DRIVE control. Set the STBY switch to SEND and adjust each drive coil.	50Ω dummy			RF	DRIVE coil	Max. ALC meter reading		NOTE: The 50Ω dummy should be connected to the ANT terminal. Otherwise drive tuming will be incorrect.
	STBY : REC								

Item 13, adjustment points:

No.	BAND	VFO	f	Parts
1	1.5	400	1.9 MHz	1.8
2	3.5	250	3.75	3.5
3	7	150	7.15	7
4	10	125	10.125	10
5	14	175	14.175	14
6	18	125	18.125	18
7	21	225	21.225	21
8	24.5	450	24.950	24.5
9	28.5	300	28.800	28

Item 14:

BAND	VFO	Parts
1.5	400	1.8
3.5	250	3.5
7	150	7
(10)	(125)	10
14	175	14
(18)	(125)	18
21	225	21
(24.5)	(450)	24.5
28.5	300	28

( ) : See note **BEFORE** adjustment

Note :

TRANSMITTING ON WARC BANDS

As supplied, the TS-530S will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required.

1. For all 3 bands : Break the line between the RF unit X44-1360-01, connector #6, Pin #1 (TOF terminal) and AF unit X49-1150-00, connector #7, Pin #4 (TOF terminal).
2. Or, for individual Bands : On the RF unit X44-1360-01 :

Band	Remove (or Cut) Part
10 MHz	D4
18 MHz	D5
24.5 MHz	D6

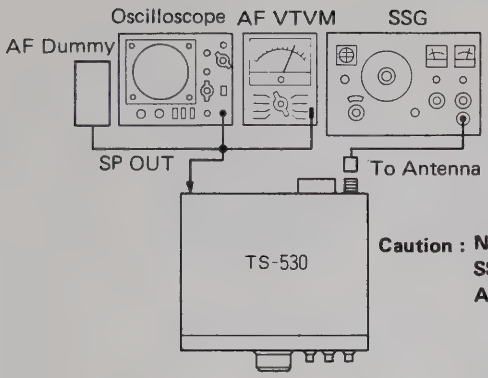
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
NB adjustment	AGC : FAST Disconnect the SSG output from the ANT terminal, and connect the noise generator output in it's place. Set the noise generator output level to S5~7.	Speaker	Rear panel	EXT. SP					
	NB : ON							The NB must provide adequate effect.	
					If adequate effect is not obtained, repeat the adjustment several times.				
	Reduce the noise generator output level to below the threshold of sensitivity. Turn the NB LEVEL control fully clockwise.							Noise must be blanked.	
	NB : OFF								
19. Neutralization trimmer adjustment	BAND : 28, +0.5 SHIFT : ON VFO :300 SG SW : ON STBY : SEND Tune the DRIVE, PLATE and LOAD	Power meter Sync'ed scope	Rear panel	ANT					Tune-up for MAX RF output.
	SG SW : OFF							RF output must be 0.	
	METER : ALC Set the ALC to maximum with the DRIVE control. Increase oscilloscope sensitivity.					Neutralization trimmer TC1	Minimum		
	Reduce oscilloscope sensitivity (5V/div.). SG SW : ON							The normal power must be obtained. The signal waveform must be normal.	
20. Side tone, semi-break-in function adjustment	Connect a power meter to the ANT terminal. Plug key into the rear Key jack to transmit in any band.	Oscilloscope AF VTVM	Rear panel	EXT. SP	AF	VR1	0.63V/8Ω		
	Operate the key.							The key must control RF output.	
	STBY : REC VOX : ON Operate the key							Semi-break-in operation should be available.	

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	AG : 300Hz ↕ 2700Hz				PLL	TC3	Adjust until the same level is obtained for both 300Hz and 2700Hz (equal audio rolloff).		
	MODE : LSB same as above					TC2			
	AG : 400Hz AG : 2600Hz							More than 1/2 with respect to the 1500Hz signal level observed on the scope.	
	After completing the above adjustment, readjust carrier suppression (see item 23.)				IF	VR4 TC1	Minimum	Less than −50dB	
	STBY : REC								
25. Speech processor adjustment	SG SW : OFF MODE : USB PROC : OFF METER : ALC Connect the AG (1500 Hz, 10mV) to the MIC input connector. STBY : SEND Adjust the MIC gain control until the meter indicates the maximum on-scale ALC reading.								
	PROC : ON				IF	VR3	Adjust until the same meter reading is obtained (max on-scale ALC).		
	STBY :REC PROC : OFF								

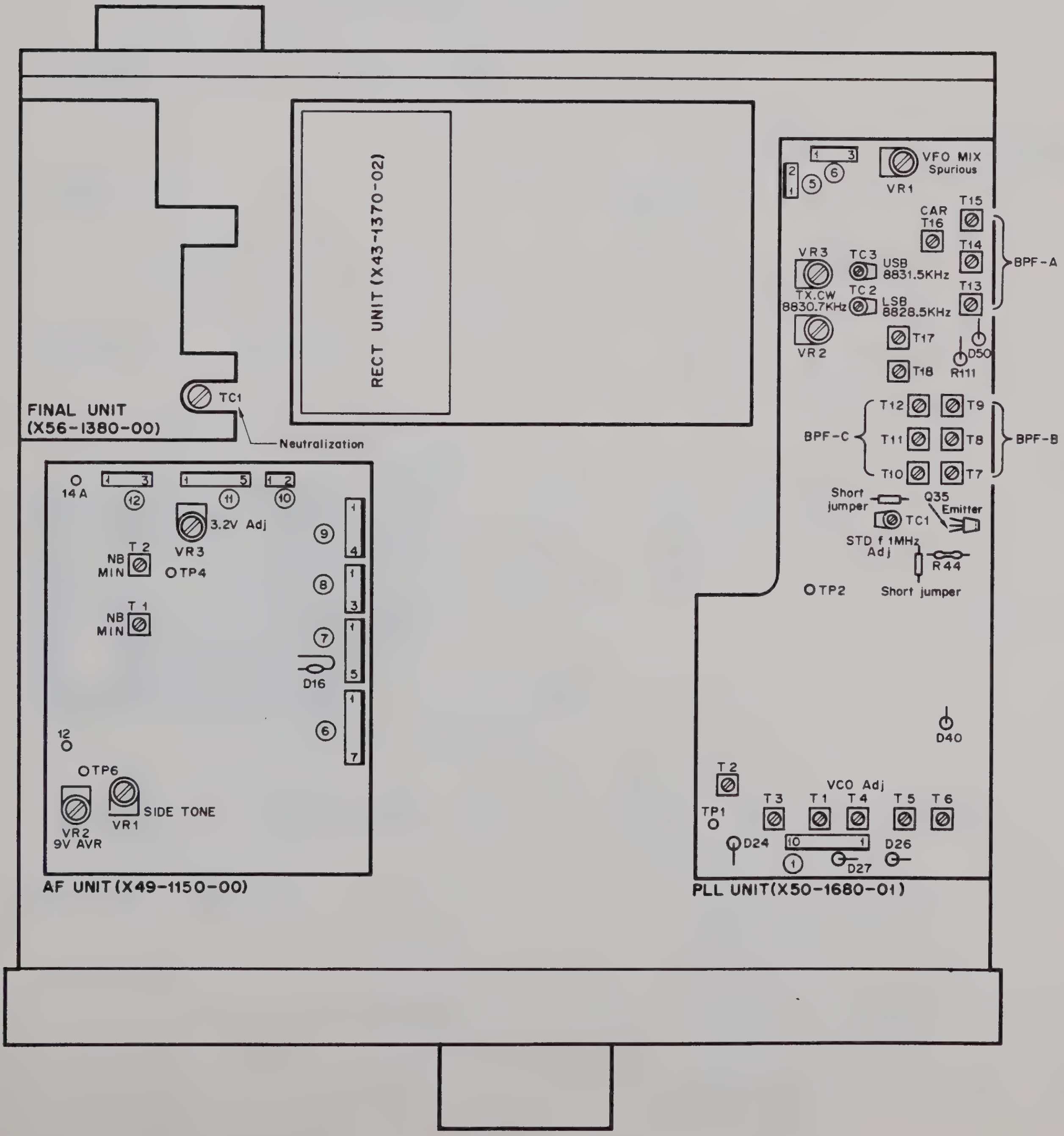
ADJUSTMENTS



Caution : Never transmit when SSG is connected to the ANT terminal.

Fig. 12 (12) IF AMP, (13) COIL PACK, (15) IF TRAP

▼ BOTTOM VIEW



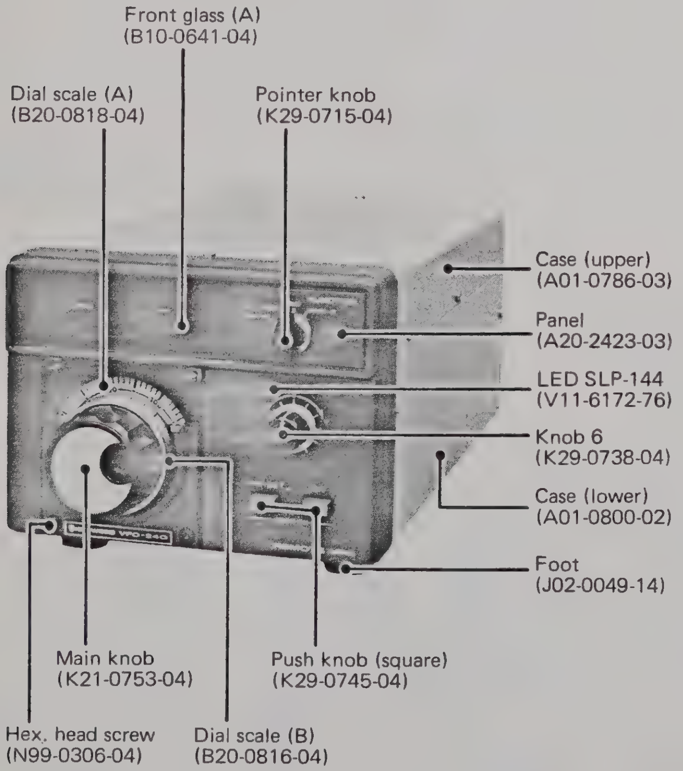
VFO-240

SPECIFICATIONS

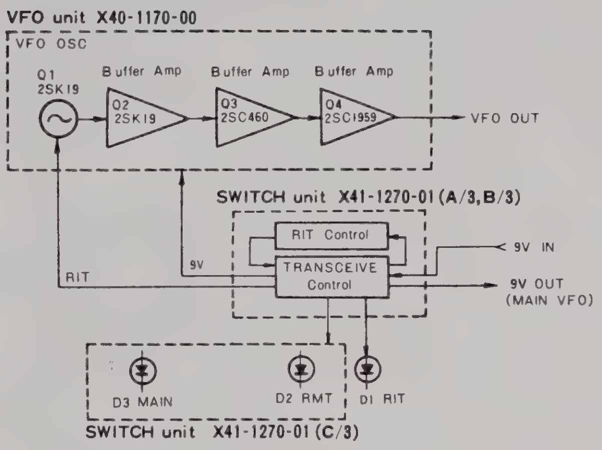
Oscillator frequency	5.50～6.00 MHz
Oscillator circuit	Clapp
Output voltage	0.2V ±1dB (across 470 ohm load)
Frequency stability	Within 100 Hz per 30 minutes after 3 minutes warm-up (at room temperature)
Solid-state complement	FET: 2 Transistor: 2 Diode: 6
Power source	From TS-530S or TS-830S
Dimensions	180 (7-1/8″) W × 133 (5-1/4″) H × 288 (11-5/16″) D mm (inch)
Weight	2.9 kg (6.4 lbs)

* Specifications are subject to change for improvement without notice.

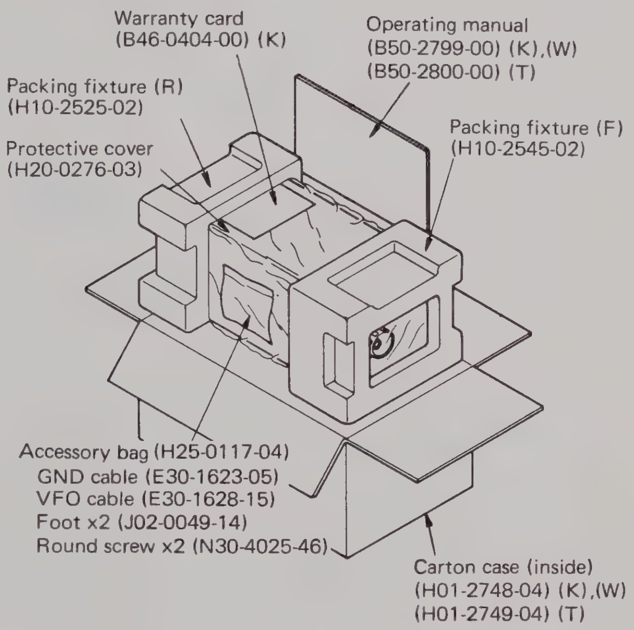
OUTSIDE VIEW



BLOCK DIAGRAM



PACKING



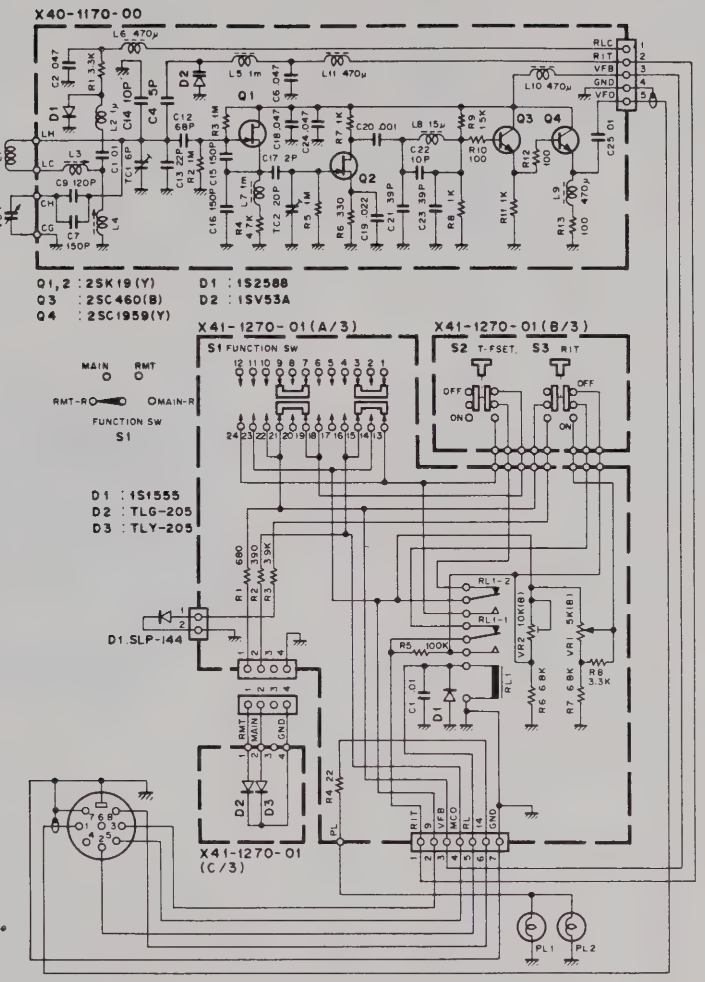
PARTS LIST

☆: New parts

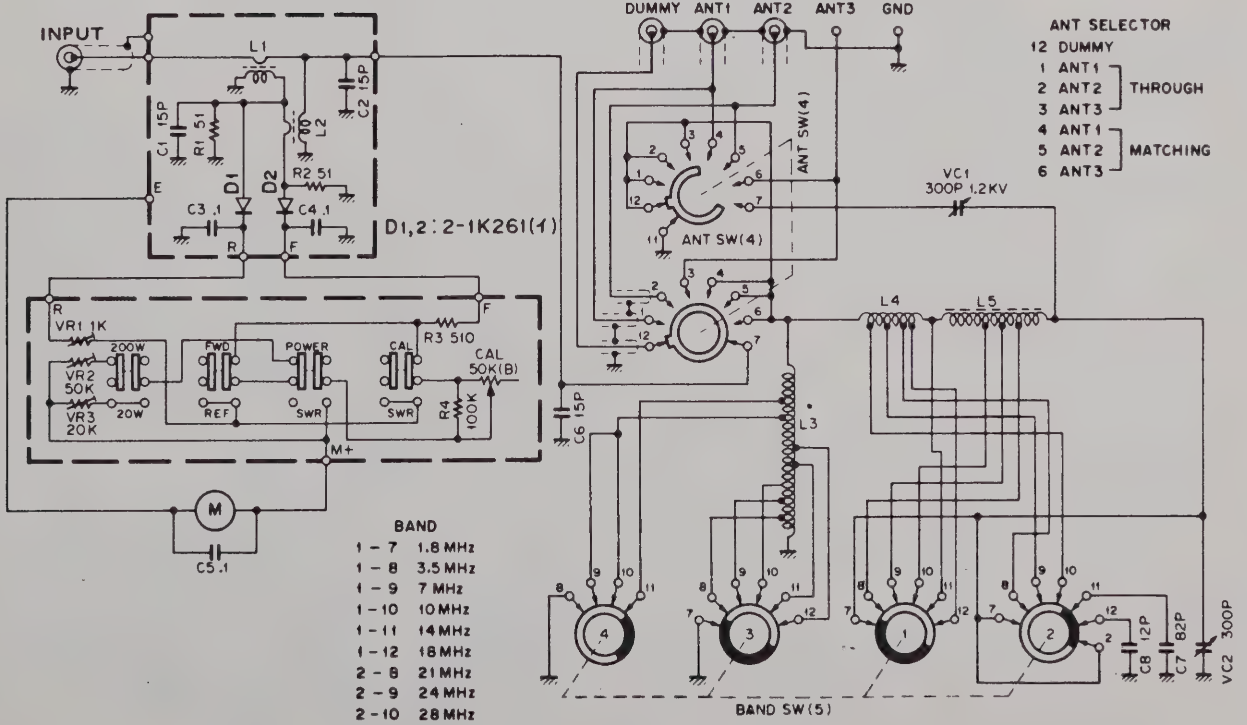
Ref. No.	Parts No.	Description	Re-marks
		VFO-240 GENERAL	
	A01-0786-03	Case (upper)	
	A01-0800-02	Case (lower)	☆
	A20-2423-03	Panel	☆
	B10-0641-04	Front glass (A)	☆
	B43-0658-04	Name plate T	☆
	B43-0659-04	Name plate K,W	☆
	B46-0404-00	Warranty card K	
	B50-2799-00	Operating manual K,W	☆
	B50-2800-00	Operating manual T	☆

VFO-240/AT-230

VFO-240
SCHEMATIC DIAGRAM

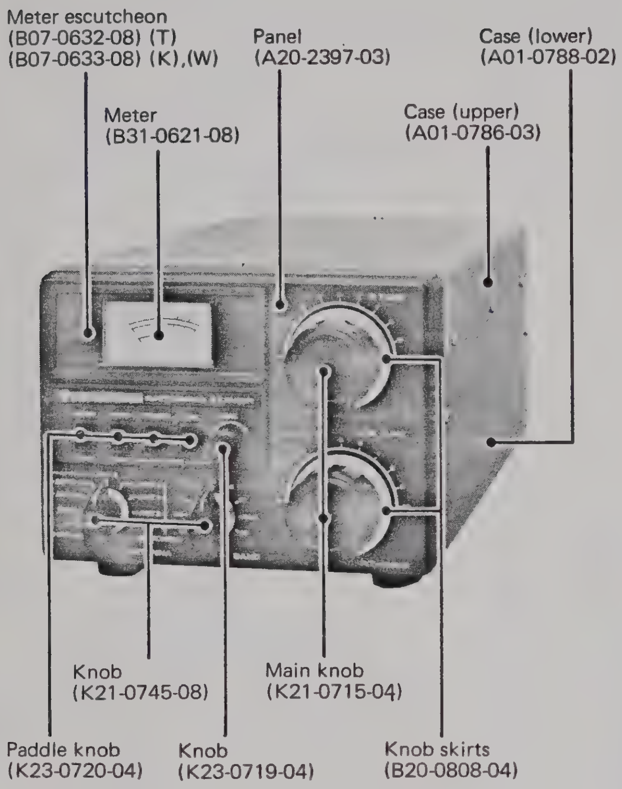


AT-230
SCHEMATIC DIAGRAM



AT-230

OUTSIDE VIEW



ADJUSTMENTS

1. INSTRUMENTS

1) Terminated Power Meter

1. Frequency range: 50 MHz or more
2. Input impedance: 50Ω
3. Power range: 20W and 200W

2) HF Transmitter or Transceiver

1) Output: 100W CW
Variable to 10W.
Example: TS-530, TS-830S

2. POWER METER ADJUSTMENT

1) Test Equipment Connection

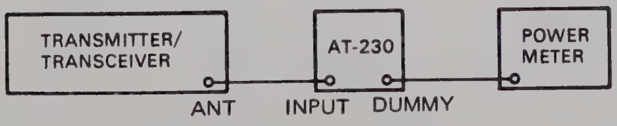


Fig. 1

2) Adjustment

1. Connect as in Fig. 1.
2. Unless otherwise specified, controls should be set as follows:

ANT SW	DUMMY
BAND SW	14
200W/20W SW	200W
FWD/REF SW	FWD
POWER/SWR SW	POWER
CAL/SWR SW	SWR

Tune up the transceiver at 14.175 MHz.

3. Adjust the transceiver for 100W output at the power meter (adjusted by the carrier level control).
Adjust VR2 on the switch unit for a meter reading of 100 on the AT-230.

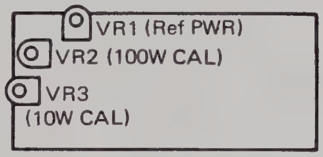


Fig. 2

4. As in step 3, lower transceiver output to 10W and adjust VR3 for a meter indication of 10 on the 20W scale.

3. CALIBRATION OF REF POWER

1) Connection

As in Fig. 1.

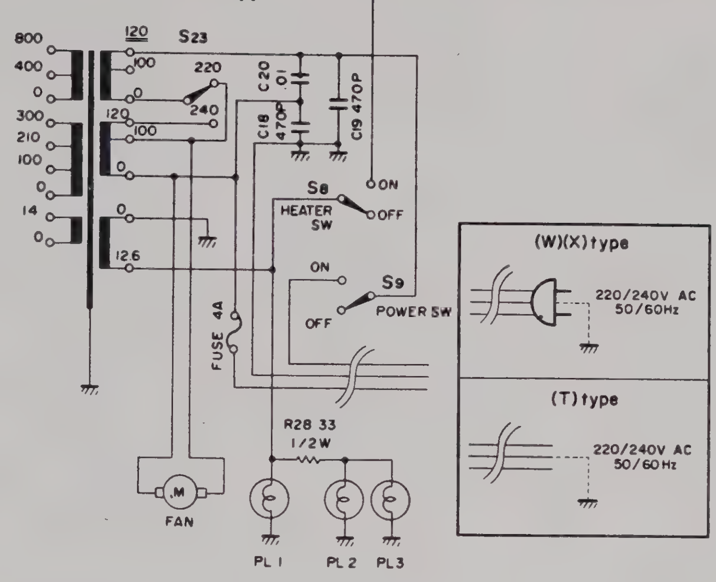
2) Adjustment

1. Set controls as described in 2.2.
Confirm 100W CW output reading.
2. Unkey the transceiver and reverse the coaxial cable between the INPUT and DUMMY terminals on the AT-230. Move the FWD/REF switch to the REF position.
3. Transmit and adjust VR1 for previously confirmed 100W reading.

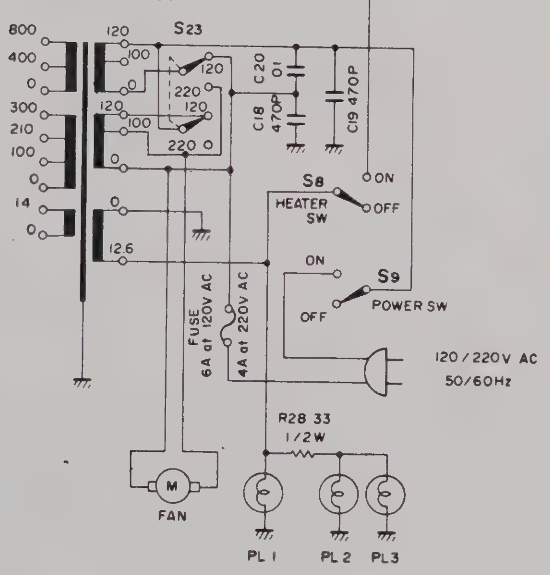
SCHEMATIC ABBREVIATION

Connector No.	Terminal name	
⑧	RLT	+9V on transmit
	RLR	+9V on receive
	−6	B −6V
⑨	ALC	ALC output from Q31
	RLT	+9V when transmit
	RLR	+9V when receive
	RL	Relay voltage
⑩	RAL	External ALC input remote socket
	VR2	Arm of TX bias control
⑪	NBV	Top of noise blanker VR
	NBS	Noise blanker SW
	9	B +9V
	PRS	Processor SW
	RF1	Top of RF gain control
⑫	NSG	Noise blanker gate signal
	RB2	Receiver bias for IF unit
	14A	14V input
	G14	14V input (ground)
	FG	Bias for control grid of 6146B
Final unit (X56-1380-00)		
	DRV	Drive input
	FG	Control grid bias
	H	Heater voltage AC12.3V
	IPM	IP meter voltage
	SG	Screen grid voltage
Rectifier unit (X43-1370-02)		
	800	B +800V
	HV	High voltage signal to METER
	300B	B +300V
	210B	B +210V
	210A	B +210V
	−C	Common B− approx. −100V
	12	Screen grid cut off voltage
	SG2	Screen grid voltage
	TUN	Screen grid voltege for TUN

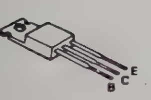
TS-530S (T)(W)(X)Type



TS-530S (M)Type



2SA473



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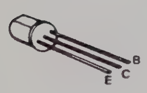

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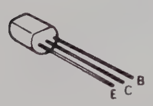
2SA1015 2SC1815
2SC945 2SC1923
2SC1515 2SC1959
2SC1675 2SC2240



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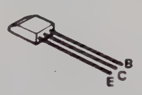

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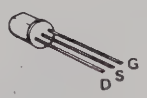
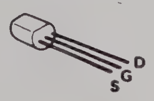


2SK125
2SK30A



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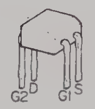
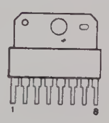
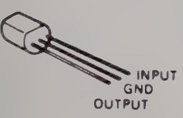


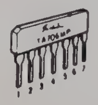
MB3712



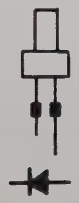
NJM78L05A



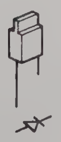
µPC1158H2



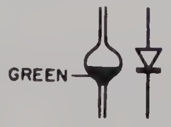
SLP-144



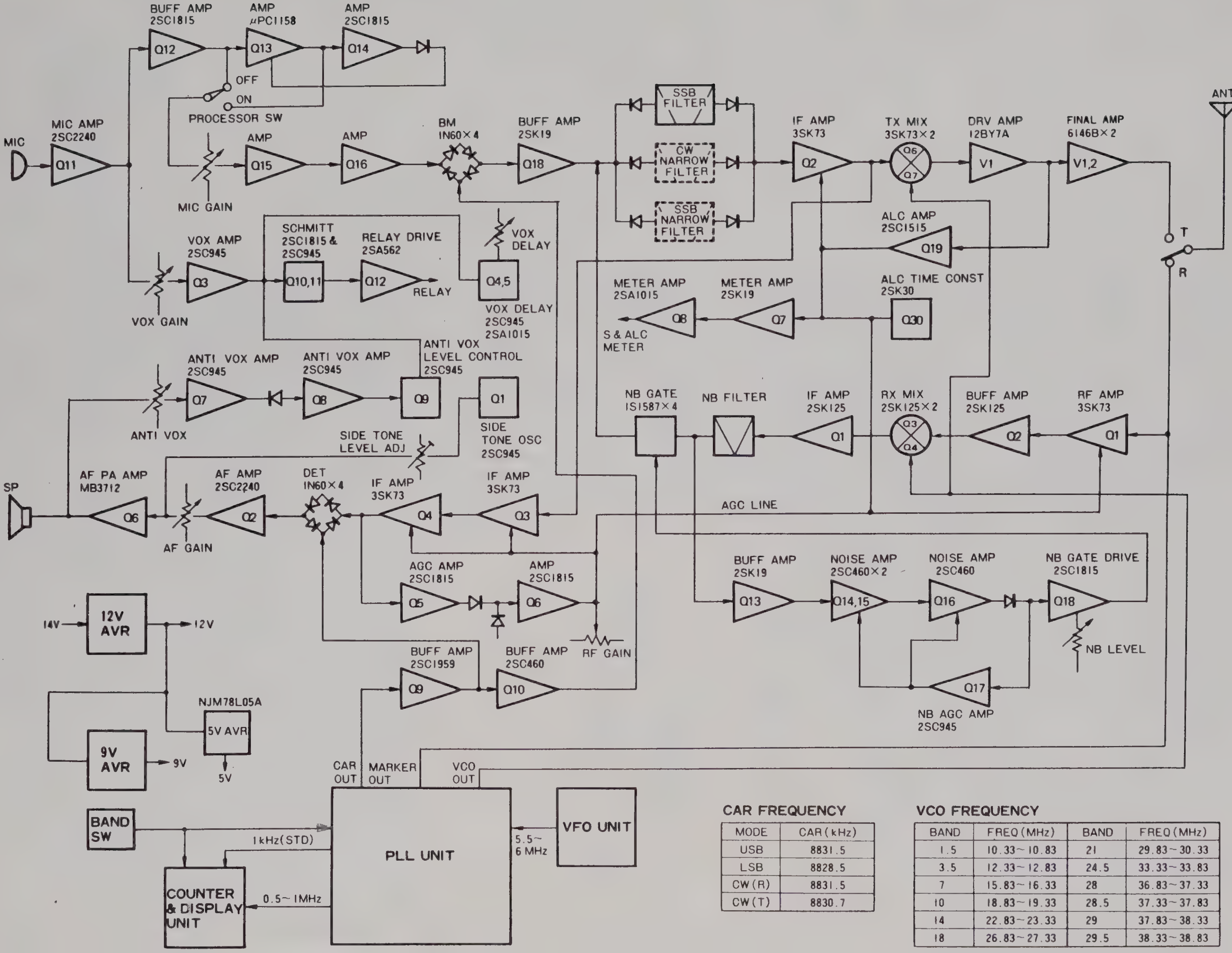
TLR-205



MV-13



BLOCK DIAGRAM



CAR FREQUENCY

MODE	CAR (kHz)
USB	8831.5
LSB	8828.5
CW (R)	8831.5
CW (T)	8830.7

VCO FREQUENCY

BAND	FREQ (MHz)	BAND	FREQ (MHz)
1.5	10.33~10.83	21	29.83~30.33
3.5	12.33~12.83	24.5	33.33~33.83
7	15.83~16.33	28	36.83~37.33
10	18.83~19.33	28.5	37.33~37.83
14	22.83~23.33	29	37.83~38.33
18	26.83~27.33	29.5	38.33~38.83

Return
evens

Please
(Odds on rear
of these)

SPECIFICATIONS

GENERAL

Frequency Range	160 m Band	1.8~2.0 MHz
	80 m Band	3.5~4.0 MHz
	40 m Band	7.0~7.3 MHz
	* 30 m Band	10.1~10.15 MHz (10.0 MHz WWV)
	20 m Band	14.0~14.35 MHz
	* 17 m Band	18.068~18.168 MHz
	15 m Band	21.0~21.45 MHz
	* 12 m Band	24.89~24.99 MHz
	10 m Band	28.0~29.7 MHz

(K) : USA
(T) : Britain
(W) : Europe
(X) : Australia
(M) : General market

Modes	SSB/CW
Frequency Stability	Within 1 kHz during the first hour after 1 minute of warmup. Within 100 Hz during any 30 minute period after warmup.
Power Requirement	120V AC (220,240V modifiable) 50/60 Hz : (K) 120/220V AC (Selectable) 50/60 Hz : (M) 220/240V AC (Selectable) 50/60 Hz : (T)(W)(X)
Power Consumption	Transmit : 295 watts Receive : 27 watts (with heaters off)
Dimensions	333 (13.3) x 133 (5.3) x 333 (13.3) mm (inch)
Weight	12.8 kg (28.2 lbs)

TRANSMITTER

* Final Power Input	220W PEP for SSB operation 180W DC for CW operation
Audio Input Impedance	500Ω~50kΩ
RF Output Impedance	50Ω~75Ω
Carrier Suppression	Better than 40 dB
Sideband Suppression	Better than 50 dB
Spurious Radiation	Better than 60 dB
Harmonic Radiation	Better than 40 dB
Audio Freq. Response	400 to 2,600 Hz within –6 dB

RECEIVER

Receiver Sensitivity	0.25μV at 10 dB S + N/N
Image Ratio	Better than 60 dB
IF Rejection	Better than 70 dB
Receiver Selectivity	
SSB/CW	2.4 kHz (–6 dB), 4.2 kHz (–60 dB) CW Optional Filter YK-88C 500 Hz (–6 dB), 1.5 kHz (–60 dB) YK-88CN 270 Hz (–6 dB), 1.1 kHz (–60 dB) SSB Optional Filter YK-88SN 1.8 kHz (–6 dB), 3.3 kHz (–60 dB)
Audio Output Impedance	8~16Ω
Audio Output	1.5 W (8Ω)

* Will transmit on the new 30, 17, and 12 meter bands.
Diodes installed for preventing accidental transmission before government Amateur authorization.

NOTE : The circuit and ratings may change without notice due to developments in technology.

CIRCUIT DESCRIPTION

This is mixed with the VCO output for each band by MIX (1) to a frequency given in **Table 4**, which is then routed through LPF (1), amplified, and wave-shaped to a digital signal. A programmable divider divides this signal into a 500 kHz output. This programmable divider is preset, as shown in **Table 4**, by the BCD signal which is counter-generated from information coming from the band switch. The phase comparator used is a Motorola MC4044P. The loop filter is made of completely discrete components to minimize VCO spurious content.

Six VCOs cover all bands. If the PLL unlocks for any reason, it will be detected from the phase comparator output. This will turn off the VCO output to prevent spurious radiation and, at the same time, the display will be blanked to inform the operator of unlock status.

BAND	RX. Tx frequency (MHz)	VCO (MHz)	MIX (1) input (MHz)	MIX (1) output (MHz)	Division ratio	DCBA
1.5	1.5 ~2.0	10.33 ~10.83	14.33 ~14.83	4.0	1/8	1 0 0 0
3.5	3.5 ~4.0	12.33 ~12.83	14.33 ~14.83	2.0	1/4	1 1 0 0
7	7.0 ~7.5	15.83 ~16.33	14.33 ~14.83	1.5	1/3	1 1 0 1
10	10.0 ~10.5	18.83 ~19.33	14.33 ~14.83	4.5	1/9	0 1 1 1
14	14.0 ~14.5	22.83 ~23.33	24.33 ~24.83	1.5	1/3	1 1 0 1
18	18.0 ~18.5	26.83 ~27.33	24.33 ~24.83	2.5	1/5	1 0 1 1
21	21.0 ~21.5	29.83 ~30.33	34.33 ~34.83	4.5	1/9	0 1 1 1
24.5	24.5 ~25.0	33.33 ~33.83	34.33 ~34.83	1.0	1/2	1 1 1 0
28	28.0 ~28.5	36.83 ~37.33	〃	2.5	1/5	1 0 1 1
28.5	28.5 ~29.0	37.33 ~37.83	〃	3.0	1/6	1 0 1 0
29	29.0 ~29.5	37.83 ~38.33	〃	3.5	1/7	1 0 0 1
29.5	29.5 ~30.0	38.33 ~38.83	〃	4.0	1/8	1 0 0 0

Table 3 Frequency chart

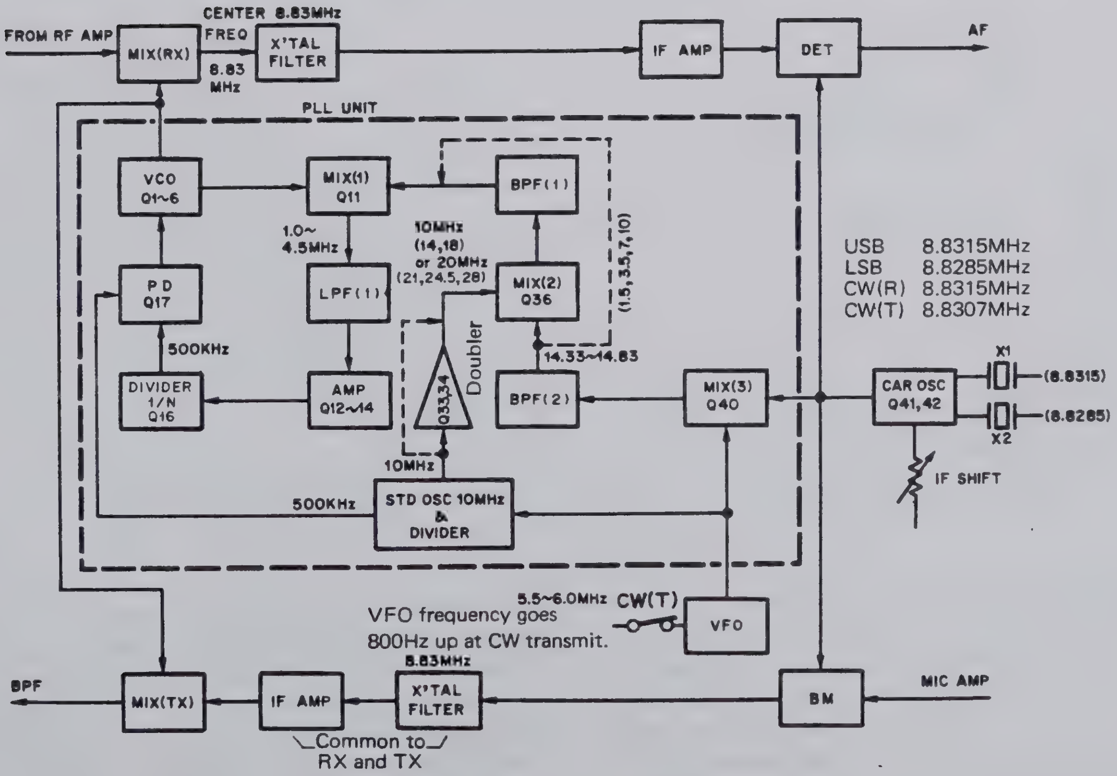
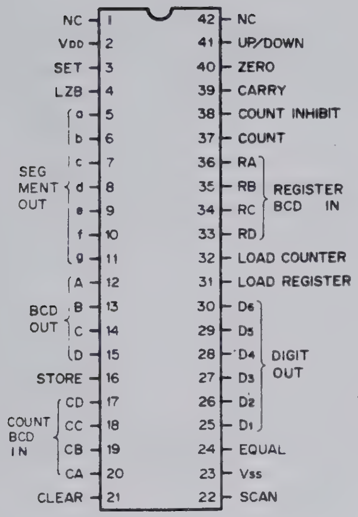


Fig. 1 TS-530 Frequency configuration

CIRCUIT DESCRIPTION


NC 1
VDD 2
SET 3
LZB 4
SEGMENT OUT a 5, b 6, c 7, d 8, e 9, f 10, g 11
BCD OUT A 12, B 13, C 14, D 15
STORE 16
COUNT BCD IN CD 17, CC 18, CB 19, CA 20
CLEAR 21
42 NC
41 UP/DOWN
40 ZERO
39 CARRY
38 COUNT INHIBIT
37 COUNT
REGISTER BCD IN 36 RA, 35 RB, 34 RC, 33 RD
32 LOAD COUNTER
31 LOAD REGISTER
DIGIT OUT 30 D6, 29 D5, 28 D4, 27 D3, 26 D2, 25 D1
24 EQUAL
23 Vss
22 SCAN

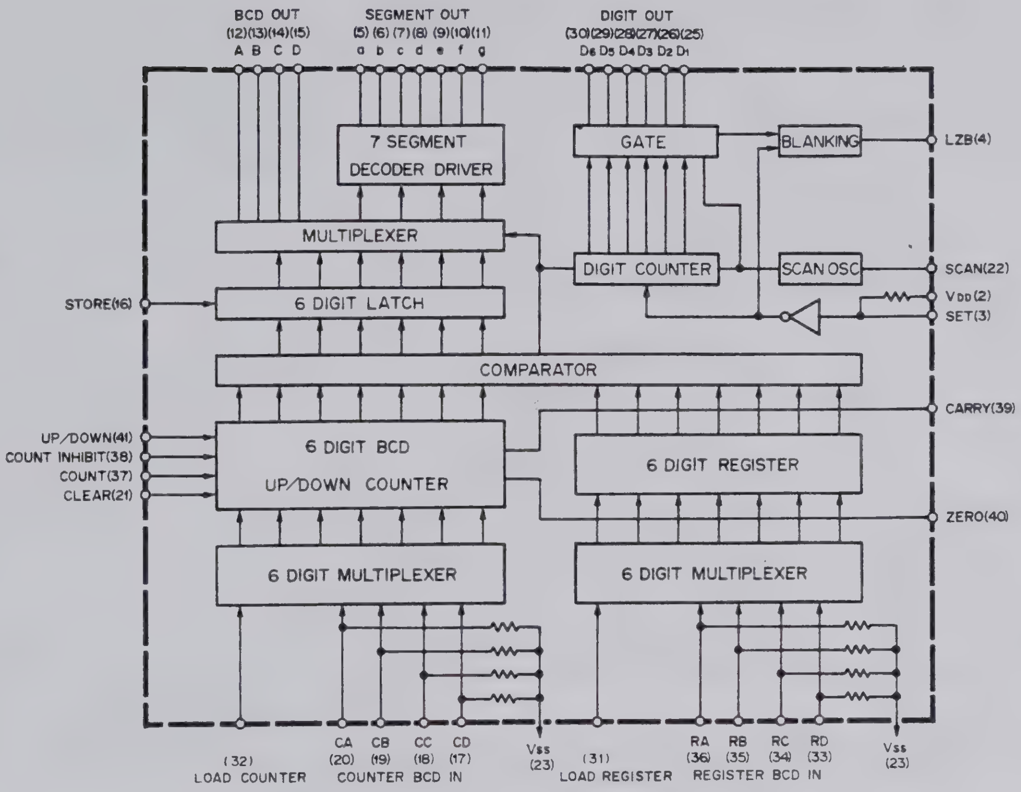


Fig. 4 TS5070P (Counter unit, Q5)

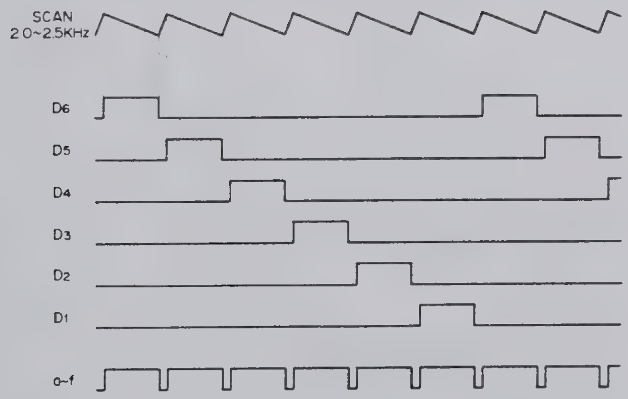
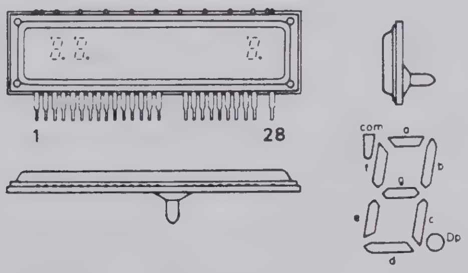


Fig. 5 TC5070P Timing chart



PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CONNECTION	F	NC												

Fig. 6 Indicating tube 9-BT-12

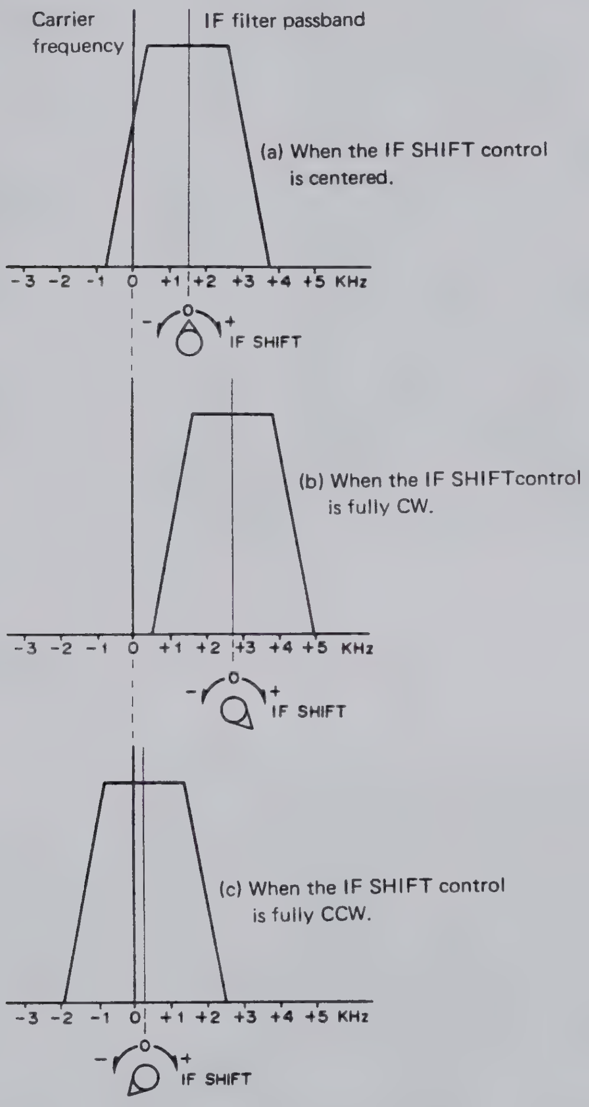
Q5 (TC5070P) is a presettable, 6-digit BCD counter which incorporates a 6-digit latch, 6-digit dynamic drive digital counter, and 7-segment decoder/driver. Band information supplied from the RF unit is applied to a diode matrix to preset the 100 kHz, 1 MHz and 10 MHz digits. Preset values are given in **Fig. 3**. For instance, to preset 14.000 MHz, with a 500 kHz counter input signal, the 10 MHz value is preset to 1, 1 MHz to 3, and 100 kHz to 5, and the 500 kHz counter input signal is subtracted from 14.000 MHz. (If no counter input signal were present, 13.500 MHz would be displayed). Q5 supplies the display tube drivers with 7-segment information and dynamic drive control signals to light the fluorescent display tube.

In the counter unit, a diode matrix generates frequency division information and supplies the PLL unit with this information. If the PLL unlocks, a BLK (Blanking Low) signal will be applied to the digit driver IC (Q11) to blank the fluorescent display tube.

CIRCUIT DESCRIPTION

2. IF SHIFT operation

The IF SHIFT circuit shifts the passband of the IF circuit without changing the receiving frequency. The relative position of the passband of the IF filter to the received signal is shifted when the IF SHIFT control is turned as shown in **Fig. 7**. The IF SHIFT circuit block diagram is shown in **Fig. 8**.



(a) When the IF SHIFT control is centered.

(b) When the IF SHIFTcontrol is fully CW.

(c) When the IF SHIFT control is fully CCW.

Fig. 7 IF SHIFT operation (for USB mode)

Frequencies within the PLL loop satisfy the following relationship.

$$N \cdot 500\,\text{kHz} \fallingdotseq f_{BPF1} - f_{VCO} \qquad (1)$$

where N : divisor of programmable divider
500 kHz : phase reference frequency
f_{BPF1} : input frequency to MIX (1)
f_{VCO} : VCO frequency

For example, in the case of 14 MHz reception, f_{BPF1} is given by eq. (1) as

$$f_{BPF1} = 10\,\text{MHz} + f_{BPF2} \qquad (2)$$

where 10 MHz : band setting frequency

$$f_{BPF2} = f_{VFO} + f_{CAR} \qquad (3)$$

where f_{VFO} : VFO frequency
f_{CAR} : carrier frequency

By substituting eq. (3) into eq.(2) and eq.(2) into eq.(1)

$$f_{VCO} = 10\,\text{MHz} + f_{VFO} + f_{CAR} - N \cdot 500\text{kHz}$$

$$\therefore f_{CAR} = f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})$$

Assuming that f_{VFO} is constant, when f_{CAR} is varied by $\pm\Delta f$,

$$\begin{aligned} f_{CAR} \pm \Delta f &= [f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})] \pm \Delta f \\ &= (f_{VCO} \pm \Delta f) + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO}) \end{aligned}$$

Thus, f_{VCO} varies by $\pm\Delta f$ as f_{CAR} is varied by $\pm\Delta f$.

The receiving frequency, f_R is given by

$$f_R = f_{VCO} - f_{CAR} \qquad (4)$$

Therefore, when f_{CAR} is shifted by $+\Delta f$, receiving frequency f'_R is given by

$$\begin{aligned} f'_R &= (f_{VCO} + \Delta f) - (f_{CAR} + \Delta f) \\ &= f_{VCO} - f_{CAR} \qquad (5) \end{aligned}$$

From equations (4) and (5),

$$f_R = f'_R$$

Thus the receiving frequency does not vary even if f_{CAR} is varied. However,

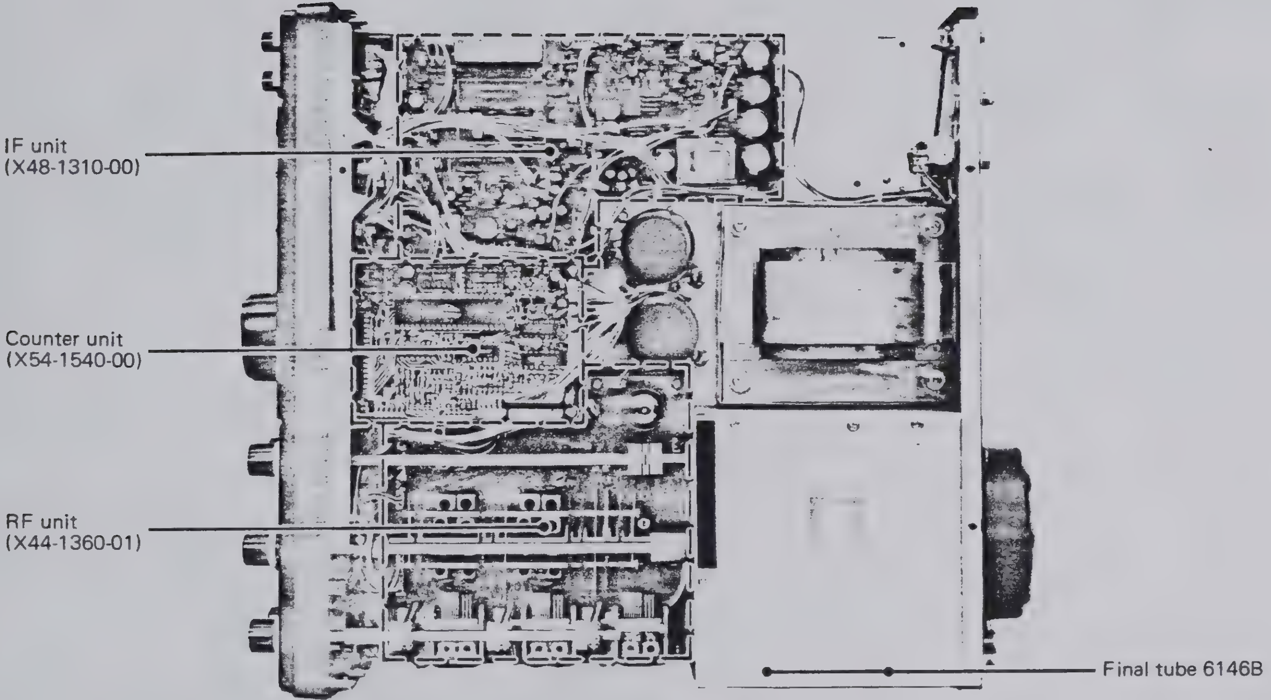
$$f_R = f_{VCO} - \text{IF frequency}$$

so the IF frequency varies as f_{VCO} varies.

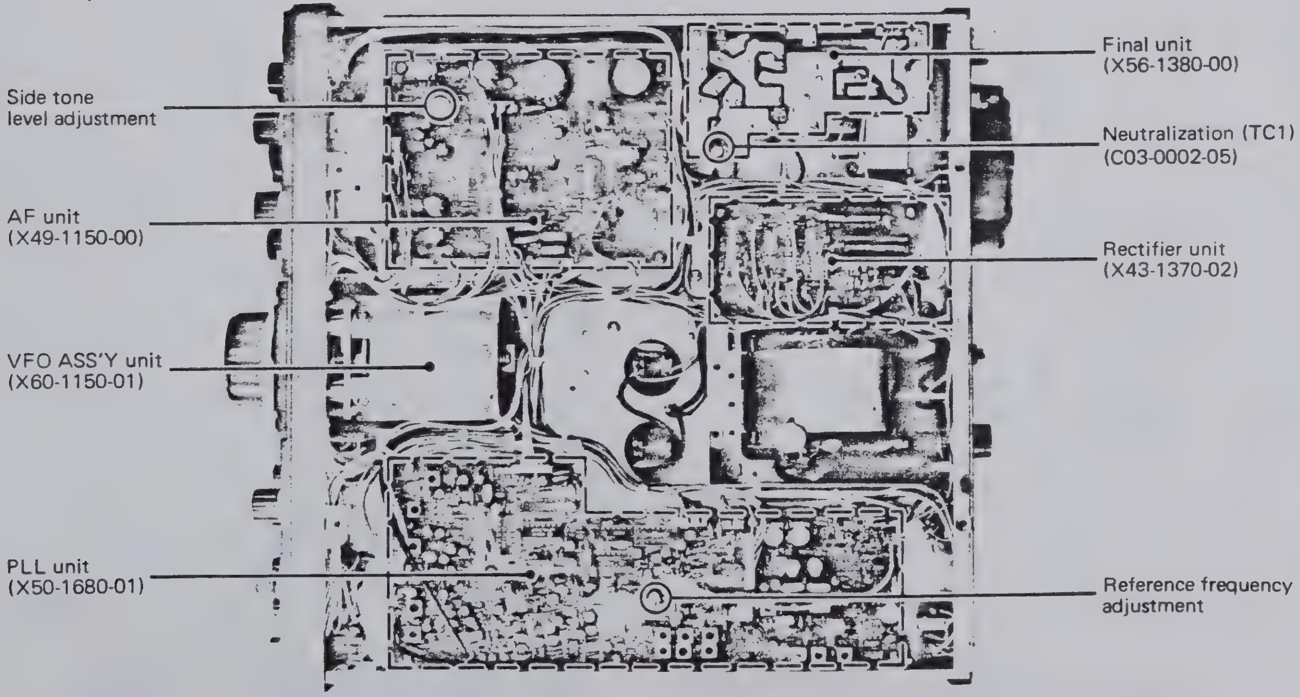
This means that the relative position of the IF filter passband to the carrier position (of the received signal) is shifted by the same amount as the f_{VCO} variation.

INSIDE VIEWS

TOP VIEW

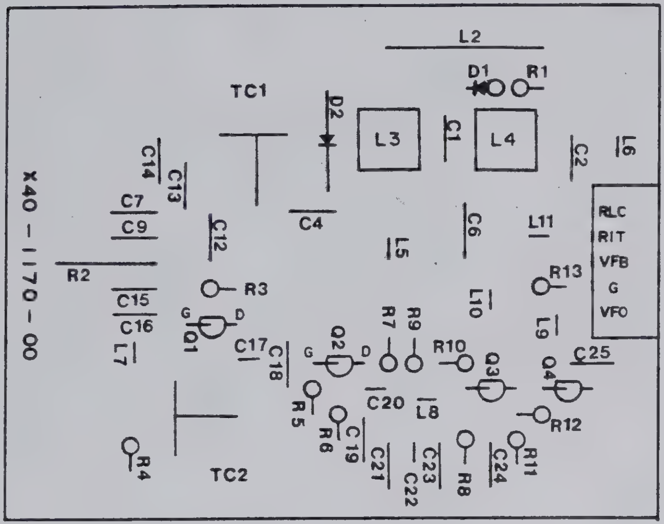


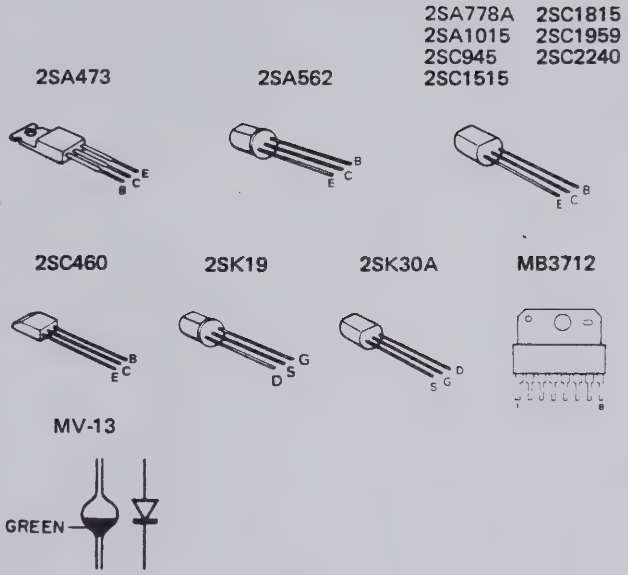
BOTTOM VIEW



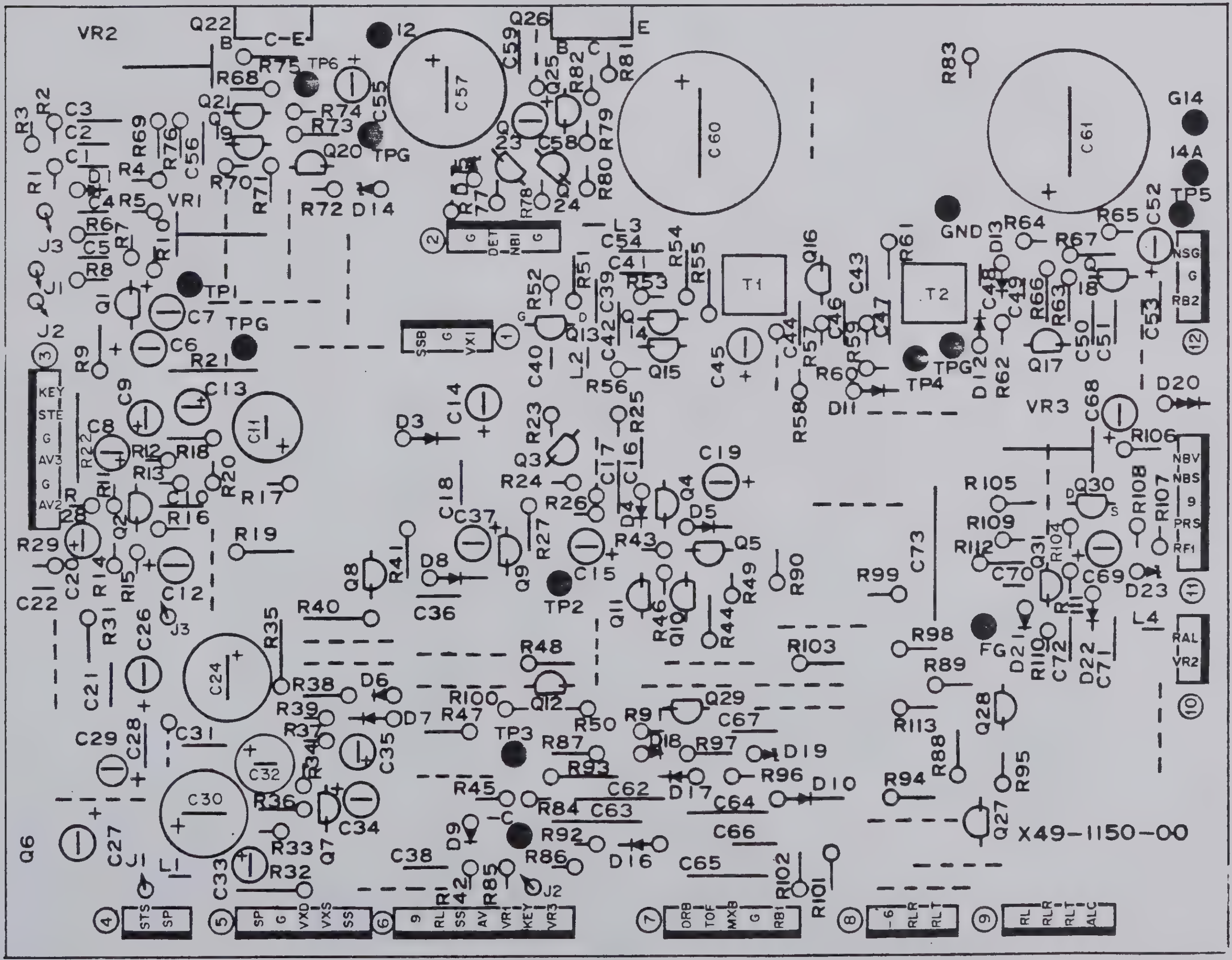
TS-530S PC BOARD VIEWS

▼ VFO UNIT (X40-1170-00) View from component side

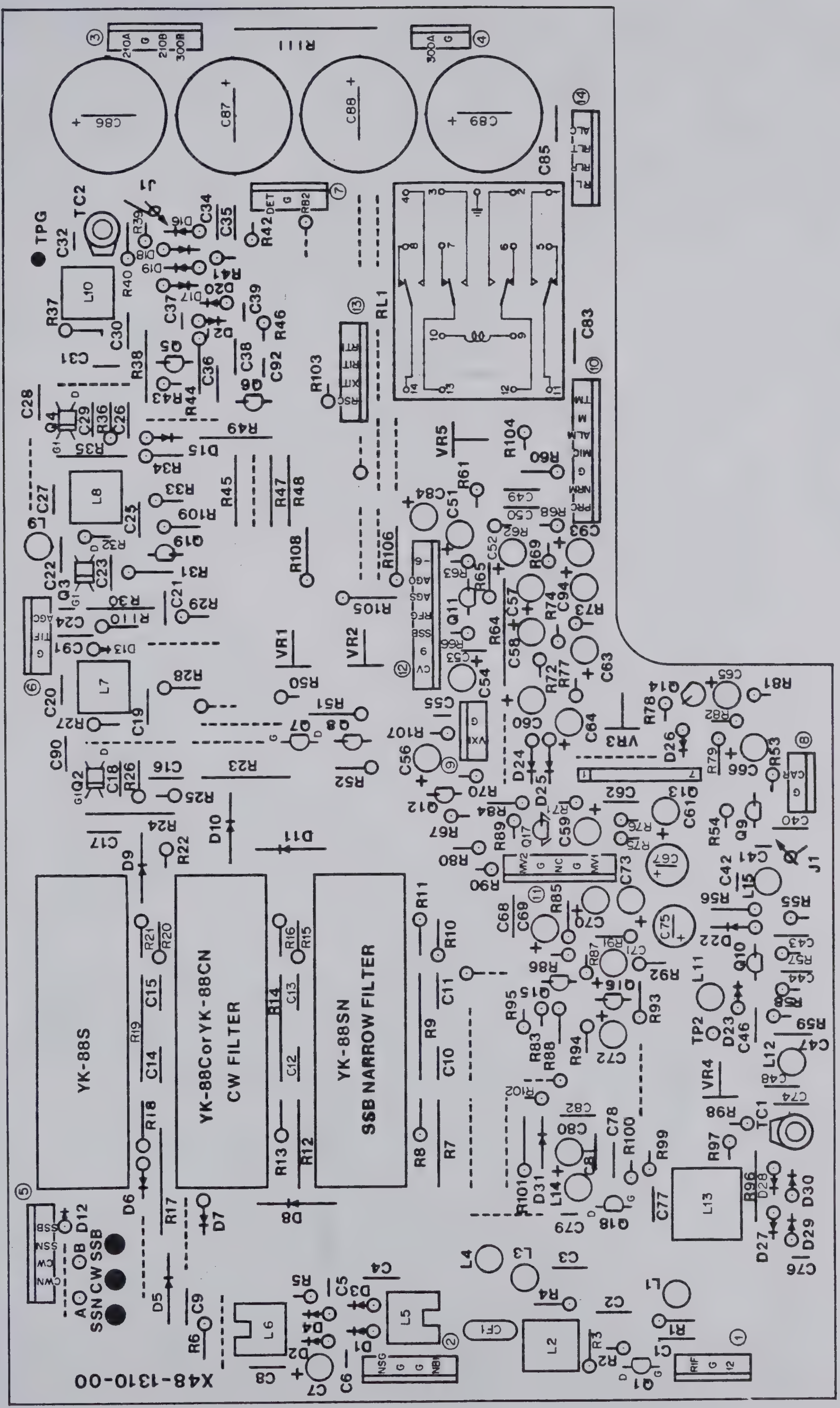




▼ AF UNIT (X49-1150-00) View from component side

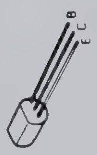


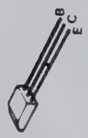
TS-530S PC BOARD VIEW

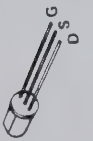


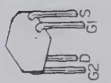
▶IF UNIT (X48-1310-00) View from component side

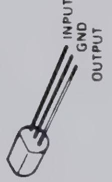
TS-530S PC BOARD VIEW


2SC1675
2SC1775
2SC1885
2SC1923
2SC1959


2SC460


2SK19


3SK73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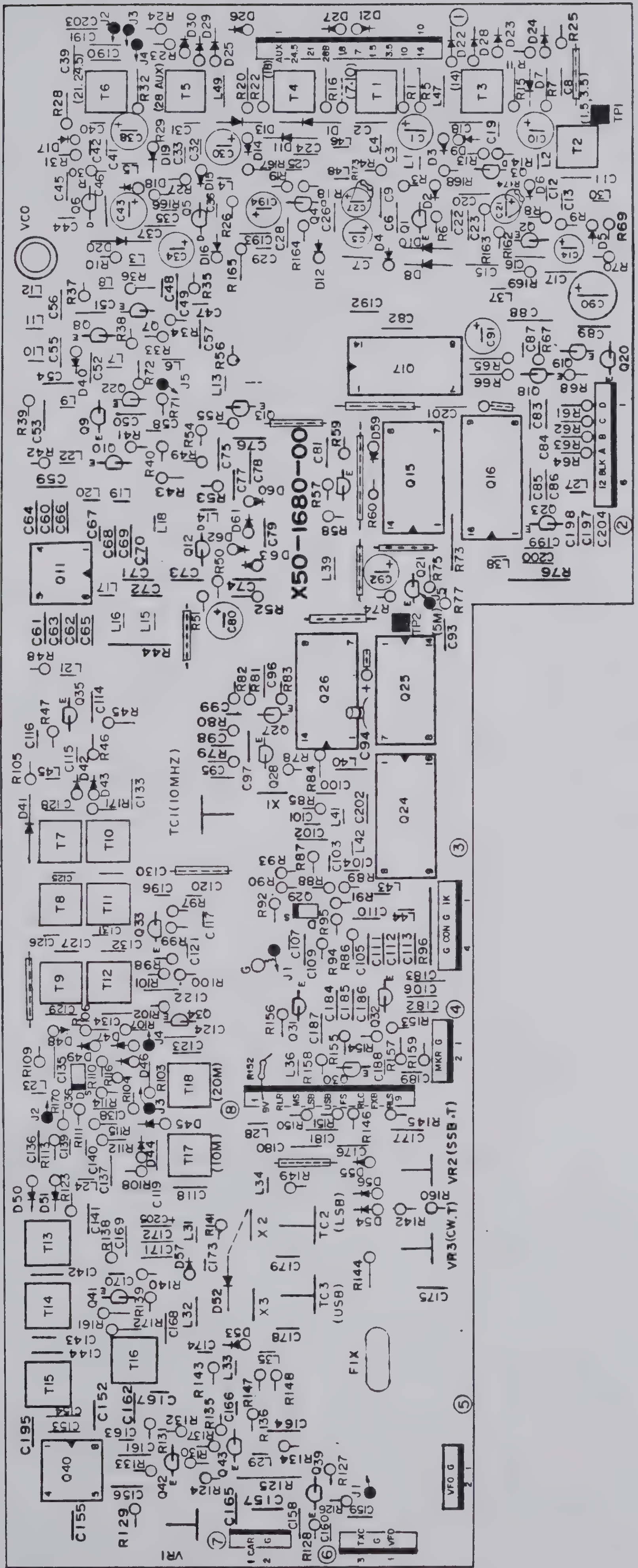
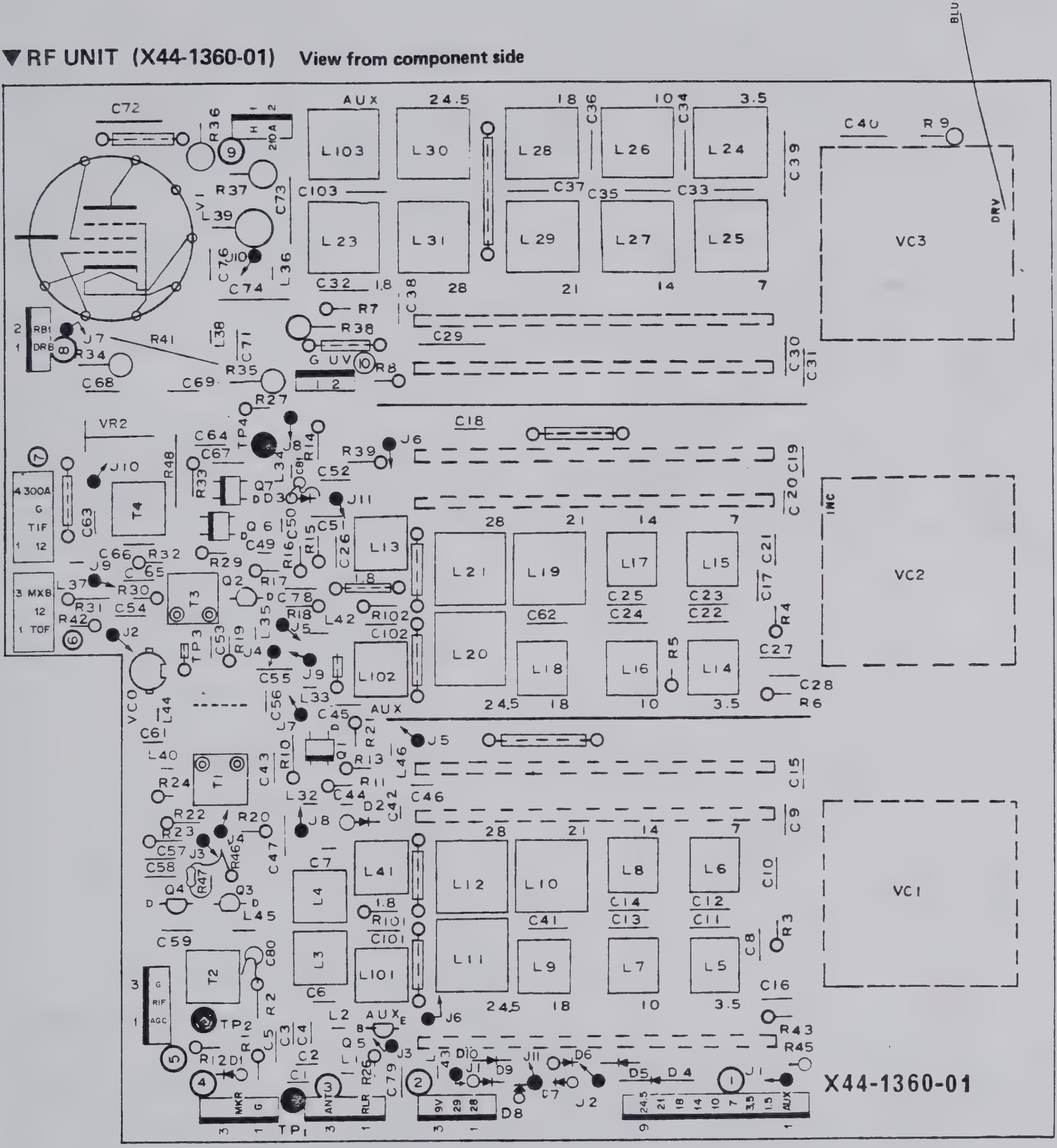


▼ PLL UNIT (X50-1680-01) View from component side

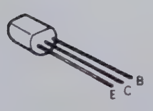
S-530S PC BOARD VIEW

▼RF UNIT (X44-1360-01) View from component side

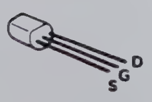


D1, 6, 7 : 3SK73(GR) Q2~4 : 2SK125 Q5 : 2SC1815(Y) D1 : 1S1587 D2, 3 1S2588 D4~10 : 1S1555 V1 : 12BY7A

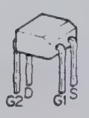
2SC1815



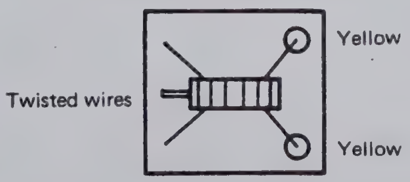
2SK125



3SK73



Attachment method of T1,T2



PARTS LIST

Note 1:
K: U.S.A. T: Britain W: Europe X: Australia

Note 2:
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration. Resistors not otherwise detailed are carbon type (1/4W or 1/8W). Order carbon resistors and capacitors according to the following example:

A carbon resistor's part number is RD14BY 2E222J.

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

RESISTOR

1. Type of the carbon resistor

RD14BY
RD14BB (small size)

RD14CY
RD14CB (small size)

2. Wattage

1W → 3A 3W → 3F 5W → 3H
2W → 3D 4W → 3G

3' = CC45 ○ ○ ...

Ceramic capacitor (type I) temperature coeff. capacitor 1' 3'.

1st word (Color)	C (Black)	L (Red)	P (Orange)	R (Yellow)	S (Green)	T (Blue)	U (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

3 = CK45 ○

Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

3. Resistance value

② ② ② → means 22 × 10² = 2200Ω (2.2 kΩ)

Example 221 → 220Ω 223 → 22 kΩ 225 → 2.2 MΩ
222 → 2.2 kΩ 224 → 220 kΩ

4. Tolerance

J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

CC	45	TH	1H	220	J
1'	2	3'	4	5	6

Type II

CK	45	F	1H	103	Z
1	2	3	4	5	6

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ..... round, square, etc.
3 = Temp. range
3' = Temp. coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

Ex. **CC45TH** = −470 ±60 ppm/°C

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

5 = Capacitor value

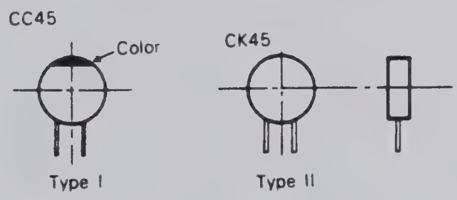
Example: 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001μF
103 → 0.01 μF

6 = Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10 μF −10 ~ +50 Less than 4.7 μF −10 ~ +75

Less than 10 pF

Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2



Abbreviation		Abbreviation	
Cap.	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

TS-530 SEMICONDUCTOR

☆: New parts

Item	Name	Parts No.	Remarks
Diode	1N60	V11-0051-05	
	1S1007	V11-4160-66	
	1S1555	V11-0076-05	
	1S1587	V11-0370-05	
	1S2588	V11-0414-05	
	V03C	V11-0290-05 200V 1.3A	
	V06B	V11-0219-05 100V 1.1A	
	V06E	V11-0285-05 400V 1.1A	
	V08J	V11-0282-05 800V 1.1A	
Varistor	MV-13	V21-0004-05	
Vari-cap diode	1SV53A	V11-4161-36	
	1SV54GC	V11-4173-46	☆
LED	SLP-144	V11-6172-76	
	TLR-205	V11-3162-96	
Zener diode	WZ-061	V11-0243-05	
	WZ-090	V11-0240-05	
	WZ-110	V11-4161-46	
	XZ-055	V11-4105-50	
	XZ-060	V11-4101-20	
	XZ-090	V11-4167-06	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
	E22-0207-05	Lug plate	
	E22-0472-05	Lug plate Final	☆
	E23-0046-04	Square terminal Switch, Relay	
	E30-0181-05	AC cord UL/CSA K, M	
	E30-0185-05	AC cord SAA X	
	E30-0585-05	AC cord CEE W	
	E30-0602-05	AC cord 3P T	
	E31-2086-05	Coax cable with plug	
	E90-0004-15	Plate cap	
	F05-4022-05	Fuse 4A W, T, X, M	
	F05-6021-05	Fuse 6A K, M	
	F09-0041-05	Fan	
	G01-0801-04	Gnd spring	
	G09-0410-05	D spring φ6	
	G13-0633-14	Cushion Meter	
	G13-0639-04	Cushion Indicating tube	
	G53-0502-04	Packing Case side	
	G53-0512-04	Packing Panel	
	H01-2741-04	Carton case (inside) K, W, X, M	☆
	H01-2742-04	Carton case (inside) T	☆
	H03-1797-04	Carton case (outside)	☆
	H10-2539-02	Packing fixture (F)	
	H10-2540-02	Packing fixture (R)	
	H20-0439-03	Protective cover	
	H25-0120-04	Protective bag	
	J02-0022-05	Foot (small)	
	J02-0049-14	Foot (large)	
	J13-0033-15	Fuse holder	
	J25-3015-04	PC board Relay	☆
	J32-0029-04	Hex. boss Relay, PLL	
	J32-0159-04	Hex. boss Final	
	J41-0006-05	Cord bushing K, M	
	J41-0024-15	Cord bushing W, T, X	
	J42-0409-04	Knob bushing +0.5 SHIFT	
	J61-0019-05	Vinyle tie	
	J61-0401-05	Nylon band	
	J61-0402-05	Free up belt W	
	K01-0406-05	Handle	☆
	K21-0723-04	Pointer knob BAND	
	K23-0738-04	Knob 1 METER, AGC	
	K23-0745-04	Knob VOX, NB, CAR	☆
	K27-0414-04	Push knob	
	K29-0713-04	Push knob +0.5 SHIFT	
	K29-0715-04	Pointer knob MODE	
	K29-0737-04	Knob 5 PLATE	
	K29-0738-04	Knob 6	
	K29-0744-04	Paddle knob STBY	☆
L1	L40-6891-13	Choke coil 6.8μH	
L2	L33-0635-05	Final choke	
L3	L34-1004-05	Final coil B 28 MHz	
L4	L34-0560-25	Final coil A	
L5	L33-0259-05	Choke coil 470μH	
T1	L01-8106-15	Power trans	
PS1,2	L39-0046-05	PS coil PLATE	
	N09-0256-05	Gnd screw	

Ref. No.	Parts No.	Description	Remarks
	N14-0115-05	Flange nut GND	
	N14-0509-05	Wing nut GND	
	N14-0517-05	Cap nut BIAS	
	N30-4012-46	Round screw Foot (large)	
	N30-4016-46	Round screw GND	
	N30-4025-46	Round screw Foot (accessory)	
	N33-3006-41	Round flat screw SP	
	N35-3008-45	Bind screw Foot (small)	
	N35-4006-41	Bind screw Case	
	N87-4012-46	Self tapping screw Foot (large)	
	N89-3006-46	Bind tapping screw Final cover	
	N99-0306-04	Hex. head screw VFO	
R22	RC05GF2H221J	Solid 220Ω 1/2W	
R24	RC05GF3A103K	Solid 10kΩ 1W	
R25,26	RC05GF2H474J	Solid 470kΩ 1/2W	
R28	RC05GF2H330J	Solid 33Ω 1/2W	
VR1	R01-3414-05	Pot. 10kΩ(A) AF	☆
VR2	R01-3415-05	Pot. 10kΩ(B) RF	☆
VR3	R01-3417-05	Pot. 10kΩ(F) IF SHIFT	☆
VR4	R01-2405-05	Pot. 5kΩ(B) RIT/XIT	
VR5	R01-3414-05	Pot. 10kΩ(A) MIC	☆
VR6	R01-3416-05	Pot. 10kΩ(B) CAR	☆
VR7	R01-4408-05	Pot. 50kΩ(B) VOX GAIN	☆
VR8	R01-0404-05	Pot. 300Ω(B) NB	
VR9	R01-6401-05	Pot. 250kΩ(B) DELAY	
VR10	R01-0405-05	Pot. 300Ω(B) ANTI	☆
VR11,12	R01-3411-05	Pot. 10kΩ(B) RF OUT, BIAS	
S1~6	S40-2419-05	Push switch PC board type	
S7	S40-2403-05	Push switch +0.5 SHIFT	
S8,9	S36-1403-05	See saw switch HEATER, POWER	☆
S11	S01-1423-05	Rotary switch AGC	
S13	S01-1427-05	Rotary switch METER	☆
S14,16	S40-2415-05	Push switch Lead type	
S17	S33-2403-05	Paddle switch STBY	☆
S18	S01-2429-05	Rotary switch MODE	☆
S20	S31-2007-05	Slide switch SG	
S22	S01-3406-05	Rotary switch FINAL	
S23	S31-2027-05	Slide switch AC volt W,T,X,M	
RL1	S51-2407-05	Relay	
	T07-0215-05	Speaker	☆
	T40-0022-05	Motor FAN	
	X43-1370-02	Rectifier unit	☆
	X44-1360-01	RF unit	☆
	X48-1310-00	IF unit	☆
	X49-1150-00	AF unit	☆
	X50-1680-01	PLL unit	☆
	X54-1540-00	Counter unit	
	X56-1380-00	Final unit	
	X60-1150-01	VFO ass'y unit	☆

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
L44	L40-2282-01	Ferri-inductor 0.22μH	
L45,46	L40-1511-03	Ferri-inductor 150μH	
T1	L19-0303-05	Wide bandwidth trans	
T2	L30-0509-05	IFT	
T3	L19-0303-05	Wide bandwidth trans	
T4	L30-0509-05	IFT	
R34	RC05GF2H104J	Solid 100kΩ 1/2W	
R35	RC05GF2H151J	Solid 150Ω 1/2W	
R36	RC05GF2H104J	Solid 100kΩ 1/2W	
R37	RS14AB3A332J	Metal film 3.3kΩ 1W	
R38	RC05GF2H474J	Solid 470kΩ 1/2W	
VR2	R12-6404-05	Trim. pot 470kΩ	
	R92-0150-05	Short jumper	
	S29-7401-05	Rotary wafer ass'y	

IF UNIT (X48-1310-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0457-05	C 0.022μF	
C5,6	CC45SL1H470J	C 47pF	
C7	CE04W1C100M	E 10μF 16V	
C9~15	C91-0457-05	C 0.022μF	
C18	C91-0456-05	C 0.047μF	
C19	C91-0457-05	C 0.022μF	
C20	CC45SL1H100D	C 10pF ±0.5pF	
C23	C91-0457-05	C 0.022μF	
C24	CC45SL1H100D	C 10pF ±0.5pF	
C25	C91-0457-05	C 0.022μF	
C26	C91-0456-05	C 0.047μF	
C27	CC45SL1H470J	C 47pF	
C28	C91-0456-05	C 0.047μF	
C29	C91-0457-05	C 0.022μF	
C30	C91-0456-05	C 0.047μF	
C31	CC45SL1H100D	C 10pF ±0.5pF	
C32	CC45UJ1H070D	C 7pF ±0.5pF	
C35	CQ92M1H333K	ML 0.033μF	
C36	C91-0456-05	C 0.047μF	
C37	CC45SL1H470J	C 47pF	
C38	C91-0457-05	C 0.022μF	
C40	C91-0456-05	C 0.047μF	
C44,47	CC45SL1H470J	C 47pF	
C49,50	CC45SL1H101J	C 100pF	
C51	CE04W1H010M	E 1μF 50V	
C52	CE04W1C100M	E 10μF 16V	
C53	CQ92M1H153K	ML 0.015μF	
C54,56~58	CE04W1H010M	E 1μF 50V	
C59	CE04W1H3R3M	E 3.3μF 50V	
C60,61,63	CE04W1H010M	E 1μF 50V	
C64	CE04W1H4R7M	E 4.7μF 50V	
C65	CE04W1C100M	E 10μF 16V	
C66	CE04W1H4R7M	E 4.7μF 50V	
C67	CE04W1A221M	E 220μF 10V	
C68	CQ92M1H473K	ML 0.047μF	
C69	CE04W1A470M	E 47μF 10V	
C70	CE04W1C100M	E 10μF 16V	
C71	CE04W1H010M	E 1μF 50V	
C72	CE04W1H3R3M	E 3.3μF 50V	
C73	CE04W1H010M	E 1μF 50V	
C74	C91-0457-05	C 0.022μF	
C75	CE04W1A221M	E 220μF 10V	
C76	CC45UJ1H100D	C 10pF ±0.5pF	
C77	CC45SL1H101J	C 100pF	
C78	C91-0457-05	C 0.022μF	
C79	CC45CH1H050C	C 5pF ±0.25pF	
C80	CE04W1C220M	E 22μF 16V	
C84	CE04W1H010M	E 1μF 50V	
C85	C91-0456-05	C 0.047μF	
C86~89	CE04W2V220	E 22μF 350V	
C91,92	CC45SL1H470J	C 47pF	
C93,94	CE04W1C100M	E 10μF 16V	
TC1,2	C05-0030-15	Ceramic trimmer 20pF	
	E23-0401-05	Round terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0573-05	Mini connect wafer 5P	
	E40-0773-05	Mini connect wafer 7P	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-1511-03	Ferri-inductor 150μH	
L2	L34-0940-05	Tuning coil	
L3,4	L40-1511-03	Ferri-inductor 150μH	
L5	L34-0942-05	Tuning coil	
L6	L34-0997-05	Tuning coil	
L7,8	L34-0535-05	Tuning coil	
L9	L40-1511-03	Ferri-inductor 150μH	
L10	L34-0536-05	Tuning coil	
L11,12	L40-1511-03	Ferri-inductor 150μH	
L13	L34-0567-05	Tuning coil BM	
L14	L40-4711-03	Ferri-inductor 470μH	
L15	L40-1511-03	Ferri-inductor 150μH	
CF1	L72-0324-05	Ceramic filter 8.83MHz NB	☆
XF1	L71-0208-05	MCF YK-88S	
R111	RS14GB3D471J	Metal film 470Ω 2W	
VR1	R12-3045-05	Trim. pot 10kΩ	
VR2	R12-6401-05	Trim. pot 470kΩ	
VR3	R12-5030-05	Trim. pot 100kΩ	
VR4	R12-0401-05	Trim. pot 100Ω	
VR5	R12-3045-05	Trim. pot 10kΩ	
	R92-0150-05	Short jumper	
RL1	S51-4401-05	Relay LZN-4	

AF UNIT (X49-1150-00)

Ref. No.	Parts No.	Description	Re-marks
C1,2	CQ92M1H123K	ML 0.012μF	
C3	CQ92M1H223K	ML 0.022μF	
C4,5	CQ92M1H123K	ML 0.012μF	
C6	CE04W1C100M	E 10μF 16V	
C7	CE04W1H010M	E 1μF 50V	
C8	CE04W1HR10M	E 0.1μF 50V	
C9	CE04W1C100M	E 10μF 16V	
C10	CQ92M1H103K	ML 0.01μF	
C11	CE04W1A101M	E 100μF 10V	
C12	CE04W1HR47M	E 0.47μF 50V	

PARTS LIST

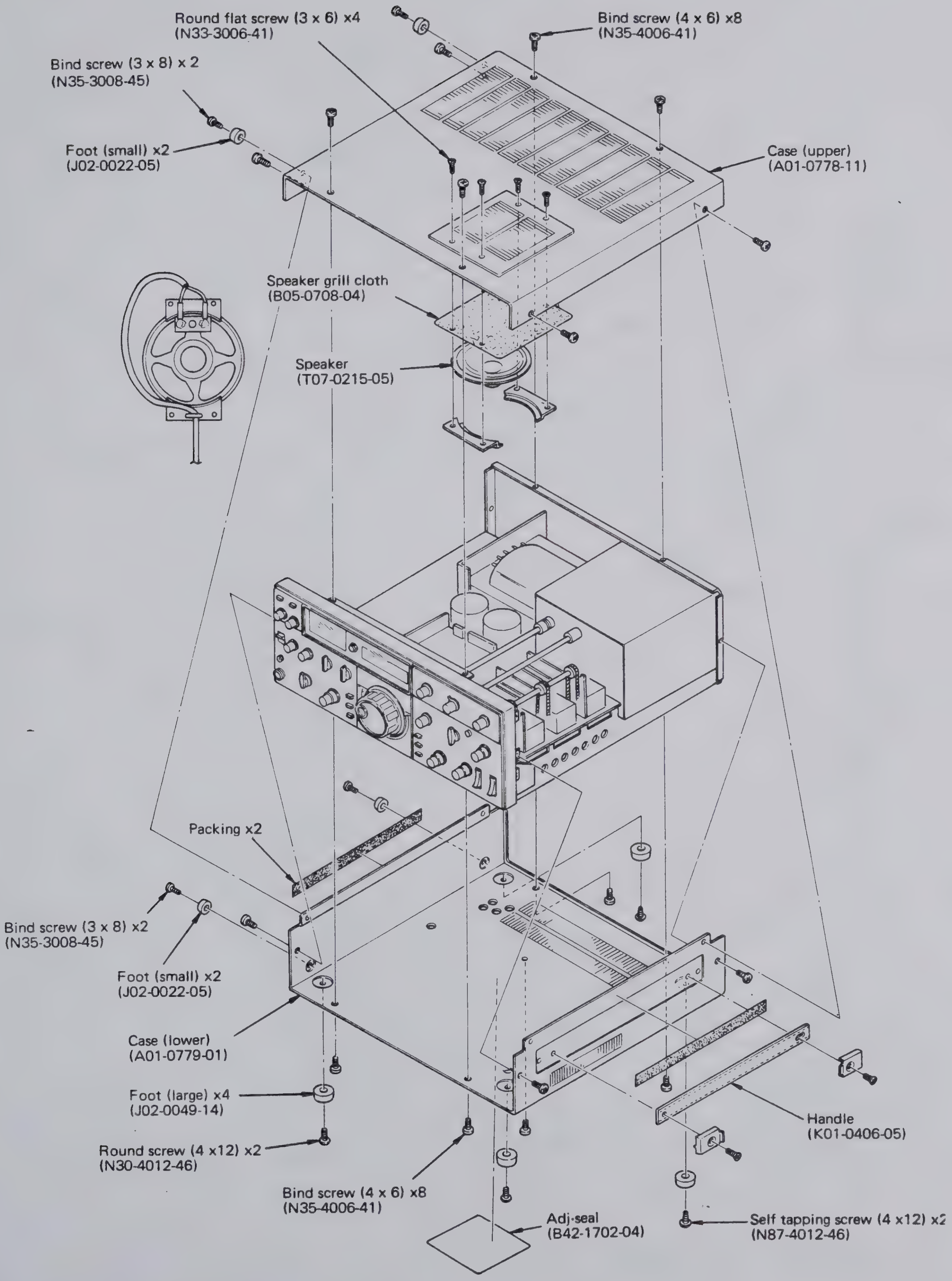
Ref. No.	Parts No.	Description	Remarks
C113	CC45SL1H101J	C 100pF	
C115	CC45RH1H100D	C 10pF ±0.5pF	
C116	CC45TH1H050C	C 5pF ±0.25pF	
C117	CC45CH1H010C	C 1pF ±0.25pF	
C118	CC45RH1H560J	C 56pF	
C120	CC45CH1H020C	C 2pF ±0.25pF	
C121	CC45SL1H470J	C 47pF	
C123	CC45RH1H390J	C 39pF	
C125	CC45TH1H330J	C 33pF	
C126	CC45TH1H150J	C 15pF	
C127	CC45TH1H330J	C 33pF	
C130	CC45UJ1H150J	C 15pF	
C131	CC45UJ1H050C	C 5pF ±0.25pF	
C132	CC45UJ1H150J	C 15pF	
C139	CC45SL1H100D	C 10pF ±0.5pF	
C140	CC45RH1H220J	C 22pF	
C142	CC45RH1H470J	C 47pF	
C143	CC45RH1H220J	C 22pF	
C144	CC45RH1H470J	C 47pF	
C159	CC45SL1H330J	C 33pF	
C160	CC45SL1H100D	C 10pF ±0.5pF	
C162	CC45CH1H010C	C 1pF ±0.25pF	
C163	CC45SL1H150J	C 15pF	
C166	CC45SL1H100D	C 10pF ±0.5pF	
C167	CC45CH1H020C	C 2pF ±0.25pF	
C169	CC45SL1H101J	C 100pF	
C172	C91-0456-05	C 0.047μF	
C173	CC45CH1H010C	C 1pF ±0.25pF	
C174	CC45UJ1H680J	C 68pF	
C178,179	CC45SL1H220J	C 22pF	
C182,183	C91-0456-05	C 0.047μF	
C184	CC45CH1H270J	C 27pF	
C185	CC45CH1H390J	C 39pF	
C186	CC45CH1H101J	C 100pF	
C187	CC45SL1H221J	C 220pF	
C188	CC45SL1H220J	C 22pF	
C189	CC45SL1H050C	C 5pF ±0.25pF	
C194	CE04W1A470M	E 47μF 10V	
C196	CC45SL1H100D	C 10pF ±0.5pF	
C197~202	C91-0456-05	C 0.047μF	
C205	CE04W1HR47M	E 0.47μF 50V	
TC1	C05-0029-15	Ceramic trimmer 50pF	
TC2,3	C05-0056-05	Ceramic trimmer 30pF	
	E04-0154-05	Coax connector	
	E23-0046-04	Square terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0673-05	Mini connect wafer 6P	
	E40-0973-05	Mini connect wafer 9P	
	E40-1073-05	Mini connect wafer 10P	
L1~7	L40-1511-03	Ferri-inductor 150μH	
L8	L40-4701-03	Ferri-inductor 47μH	
L9	L40-1592-02	Ferri-inductor 1.5μH	
L10	L40-1092-02	Ferri-inductor 1μH	
L11	L40-1292-02	Ferri-inductor 1.2μH	
L12	L40-1892-02	Ferri-inductor 1.8μH	
L13,14	L40-4711-03	Ferri-inductor 470μH	
L15,16	L40-8201-03	Ferri-inductor 82μH	
L17	L40-1511-03	Ferri-inductor 150μH	
L18~20	L40-2701-03	Ferri-inductor 27μH	
L21~24,27~30	L40-1511-03	Ferri-inductor 150μH	

Ref. No.	Parts No.	Description	Remarks
L31	L40-2211-03	Ferri-inductor 220μH	
L32	L33-0636-05	Choke coil 20μH	
L33~36	L40-1511-03	Ferri-inductor 150μH	
L37	L40-4711-03	Ferri-inductor 470μH	
L38,39	L40-1511-03	Ferri-inductor 150μH	
L40	L40-4711-03	Ferri-inductor 470μH	
L41,42	L40-4701-03	Ferri-inductor 47μH	
L43,44	L40-2211-03	Ferri-inductor 220μH	
L45~49	L40-1511-03	Ferri-inductor 150μH	
T1	L32-0195-05	OSC coil 7, 10 MHz	
T2	L32-0193-05	OSC coil 1.5, 3.5 MHz	
T3	L32-0196-05	OSC coil 14 MHz	
T4	L32-0199-05	OSC coil 18 MHz	
T5	L32-0198-05	OSC coil 28 MHz	
T6	L32-0197-05	OSC coil 21, 24.5 MHz	
T7	L34-0714-05	Tuning coil	
T8	L34-0715-05	Tuning coil	
T9	L34-0716-05	Tuning coil	
T10	L34-0717-05	Tuning coil	
T11	L34-0718-05	Tuning coil	
T12	L34-0757-05	Tuning coil	
T13	L34-0711-05	Tuning coil	
T14	L34-0713-15	Tuning coil	
T15	L34-0712-05	Tuning coil	
T16	L32-0201-05	OSC coil 8.83 MHz	
T17	L34-0709-05	Tuning coil 10 MHz	
T18	L34-0710-05	Tuning coil 20 MHz	
X1	L77-0482-05	Crystal 10 MHz	
X2	L77-0486-05	Crystal 8.8285 MHz	
X3	L77-0485-05	Crystal 8.8315 MHz	
VR1	R12-5030-05	Trim. pot 100kΩ	
VR2,3	R12-1040-05	Trim. pot 4.7kΩ	
	R92-0150-05	Short jumper	

COUNTER UNIT (X54-1540-00)

Ref. No.	Parts No.	Description	Remarks
C2	C91-0456-05	C 0.047μF	
C3	C91-0457-05	C 0.022μF	
C4	CC45SL1H150J	C 15pF	
C6	CE04W1A470Q	E 47μF 10V	
C7	CE04W1A101Q	E 100μF 10V	
C8,9	C91-0456-05	C 0.047μF	
C11	CE04W1C101M	E 100μF 16V	
C12	CE04W1V100Q	E 10μF 35V	
C13	CQ92M1H103K	ML 0.01μF 50V	
C14~16	CE04W1V100Q	E 10μF 35V	
C17,18	C91-0456-05	C 0.047μF	
C19	CQ92M1H103K	ML 0.01μF 50V	
C21,22	CC45SL1H050C	C 5pF ±0.25pF	
C23	CE04W1A330Q	E 33μF 10V	
C24~26	C91-0456-05	C 0.047μF	
C28	CE04W1H100M	E 10μF 50V	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-4711-03	Ferri-inductor 470μH	
L2	L40-1011-04	Ferri-inductor 100μH	
L3	L40-2211-03	Ferri-inductor 220μH	
L4	L40-1511-03	Ferri-inductor 150μH	

DISASSEMBLY



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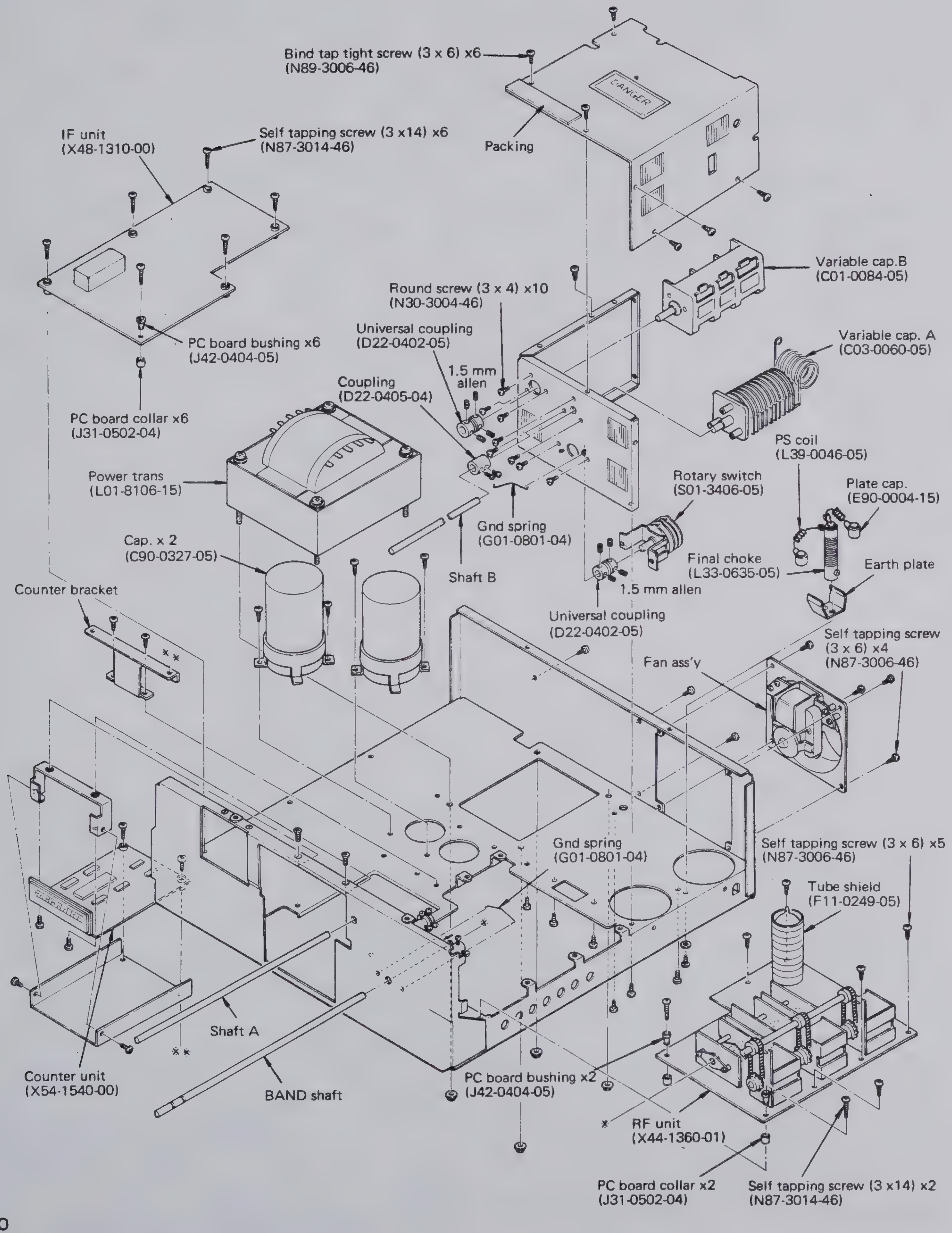

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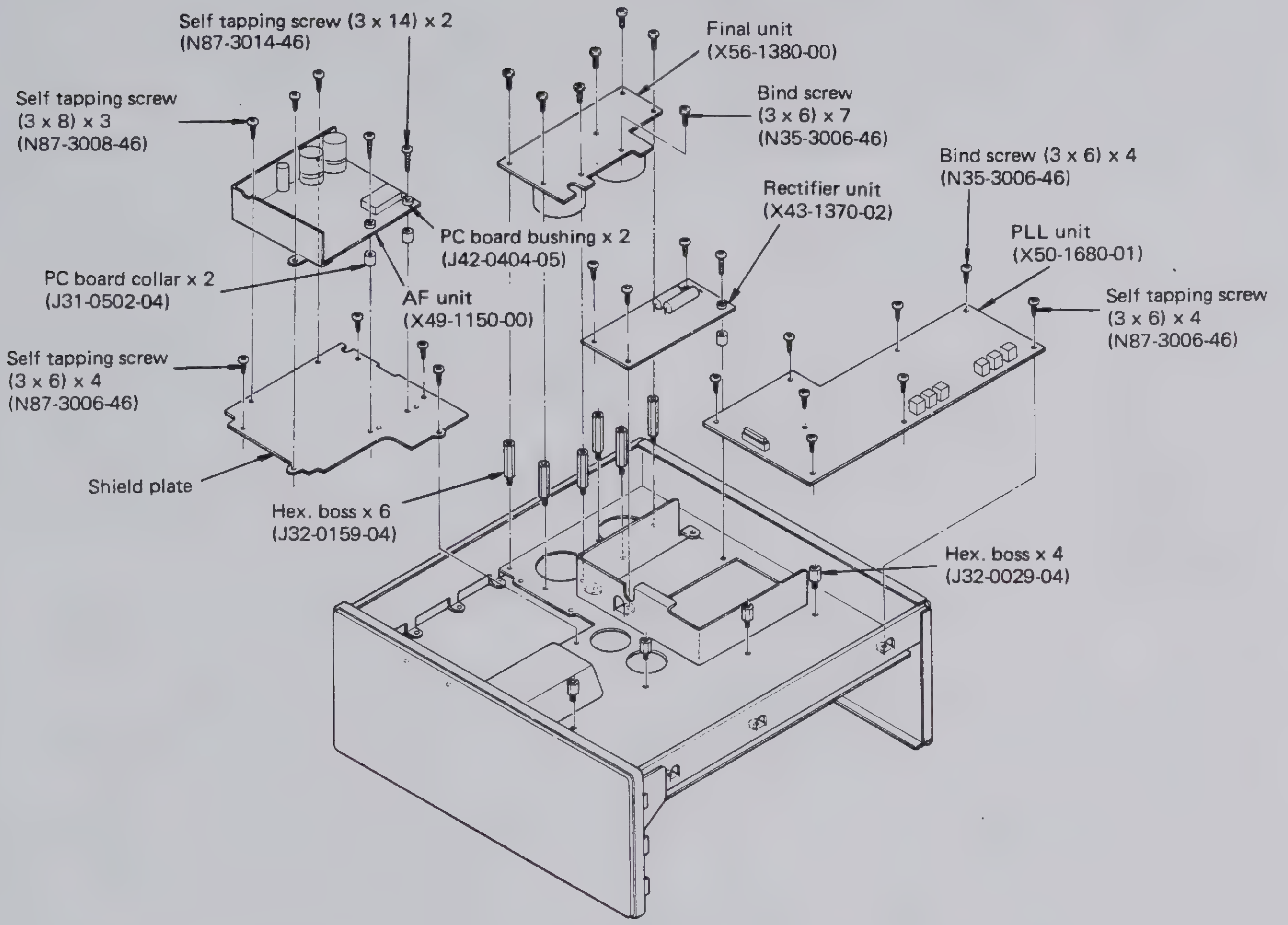
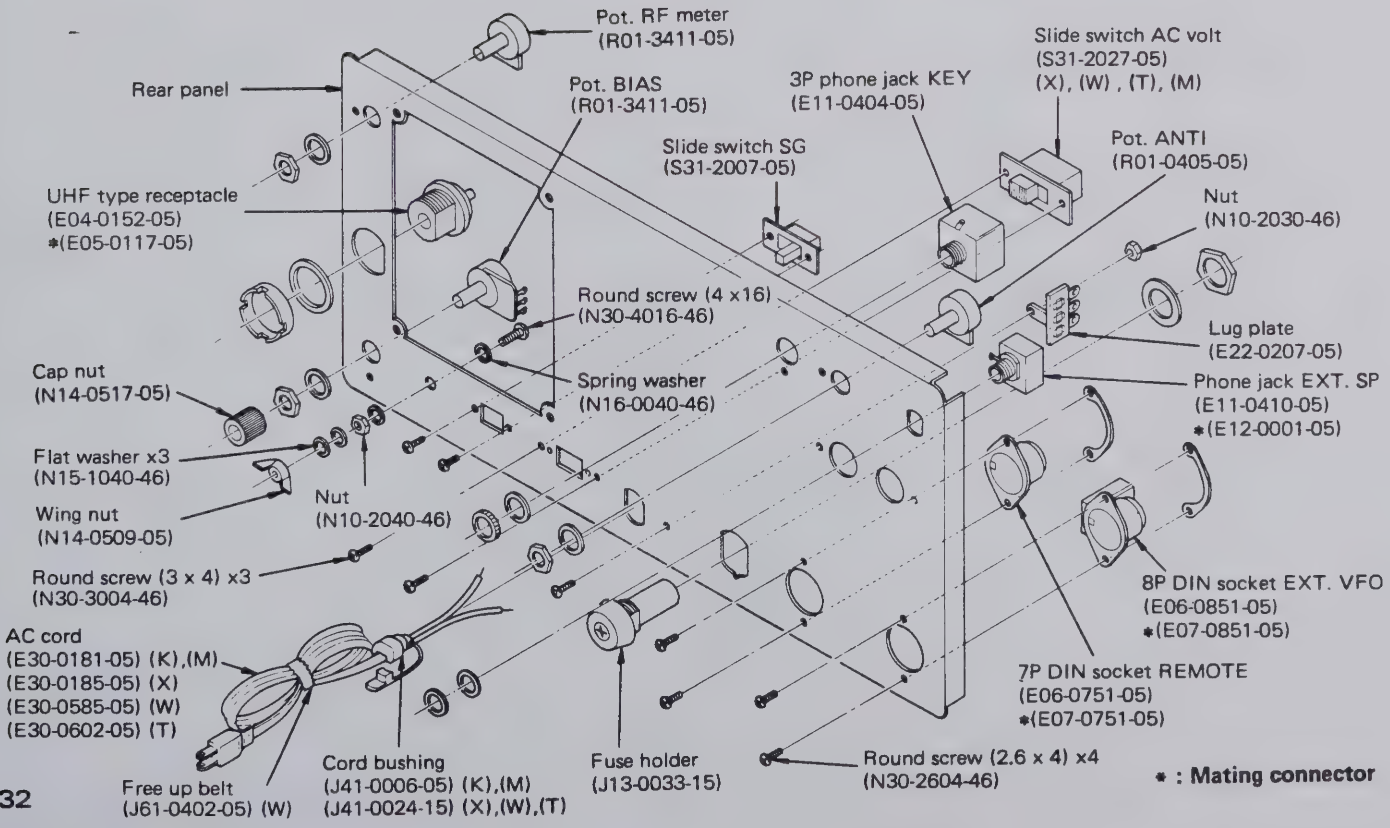




*** : Mating connector**

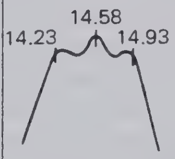
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. 9V AVR and 3.2V adjustment		DVM	AF	TP-6	AF	VR2	9V	9V±0.05V	
				Pin-5, connector ⑪		VR3	3.2V	3.2V±0.05V	RF1 (FET bias)
2. Base current adjustment	SG SW : ON MODE: USB METER : IP HEATER : ON DRIVE : Fully clockwise STBY : SEND BIAS pot. : Adjust	1P meter			Rear panel	Bias pot.		Set to 60mA	
	STBY REC, SG SW OFF								
3. Carrier adjustment①	IF SHIFT : Centered MODE : USB	RF VTVM	IF	Pin1, connector ⑧	PLL	NOTE : T16	0.3V	0.3V±1 dB	NOTE : The slug of T16 should be turned counter clockwise for this adjustment after the peak point is determined.
	MODE : LSB STBY : REC ↕ SEND	F. counter				VR2	Obtain the same frequency for both transmission and reception	±20 Hz	
	STBY : REC					TC2	8828.50 kHz		
	MODE : USB					TC3	8831.50 kHz		
	MODE : CW STBY : SEND					VR3	8830.70 kHz		
	STBY : REC								
4. IF SHIFT check	MODE : LSB Rotate the IF SHIFT and check the variation	F. counter	IF	Pin 1, connector ⑧				Set IF SHIFT to center. More than + 1.1 kHz , Less than −1.1 kHz.	
	MODE : USB Same as above								
	STBY : SEND Regardless of the IF SHIFT setting							8831.50 kHz	USB
								8828.50 kHz	LSB
	STBY : REC								
5. VFO, RIT check and adjustment	Scale 0~500							Should rotate smoothly and have no abnormal noise.	
	Rear panel SG SW OFF	RF VTVM	PLL	Pin 1, connector ⑥ 2P(GND)	Adjust if the voltage is out of specification.			200 mV±1 dB	
	VFO : 250				VFO	TC2	200mV		
	MODE : CW STBY : SEND	F. counter	Rear panel	EXT VFO 1P, 7P (GND)		Adjust if the frequency is out of specification.	800 Hz UP	800±50 Hz	CW SHIFT

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	RIT OFF								
6. Reference oscillator adjustment		F. counter	PLL	TP2	PLL	TC1	1000.000 kHz		
7. VCO adjustment and check	Check the frequencies at the following points and adjust coils until those given in brackets are obtained.	F. counter DVM	PLL PLL	D40 TP1					

VFO BAND	0	250	500	Adjusting point	
				Unit	Part
1.5	10.33 MHz	10.58 MHz (4.0V)	10.83 MHz	PLL	T2
3.5	12.33	12.58	12.83		
7	15.83	16.08 (4.75V)	16.33		T1
10	18.83	19.08	19.33		
14	22.83	23.08 (4.5V)	23.33		T3
18	26.83	27.08 (5.0V)	27.33		T4
21	29.83	30.08 (3.5V)	30.33		T6
24.5	33.33	33.58	33.83		
28	36.83	37.08	37.33		T5
28.5	37.33	37.58	37.83 (4.75V)		
29	37.83	38.08	38.33		
29.5	38.33	38.58	38.83		

Item	Condition	Test equipment	Unit	Terminal	Unit	Parts	Method	Specification	Remarks
	Check the level at each of the above points.	RF VTVM	RF	TP3				1V^{+3}_{-2} dB	
PLL lock range	Both edges of the VFO frequency in each band.							Display should indicate.	
8. BPF-A	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D24 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the sweep generator RF output to the EXT-VFO connector.	Sweep generator Oscilloscope	PLL	Q35 Ⓔ	PLL	T13 T14 T15	Adjust until the response shown to the right is obtained.		

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
13. Coil pack adjustment	Connect the SSG (40dB) to the ANT terminal DRIVE : 12:00 While adjusting, gradually decrease the SSG output level down to −6 dB. Adjust at the following points:	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil RF coil	Max. audio output		

No.	BAND	VFO	f	Parts
1	1.5	400	1.9 MHz	1.8
2	3.5	250	3.75	3.5
3	7	150	7.15	7
4	10	125	10.125	10
5	14	175	14.175	14
6	18	125	18.125	18
7	21	225	21.225	21
8	24.5	450	24.950	24.5
9	28.5	300	28.800	28

Item	Condition	Test equipment	Unit	Terminal	Unit	Parts	Method	Specification	Remarks
14. Drive coil adjustment	CAL : ON CAR VR : optinum level METER : ALC HEATER : ON MODE : CW SG SW : OFF ANT : 50Ω dummy should be connected. Connect pin 2 to pin 4, connector ⑦ on the AF unit with a clip lead. Receive the marker frequency in the following bands and obtain the peak level by adjusting the DRIVE control. Set the STBY switch to SEND and adjust each drive coil.	50Ω dummy			RF	DRIVE coil	Max. ALC meter reading		NOTE: The 50Ω dummy should be connected to the ANT terminal. Otherwise drive tuming will be incorrect.

BAND	VFO	Parts
1.5	400	1.8
3.5	250	3.5
7	150	7
(10)	(125)	10
14	175	14
(18)	(125)	18
21	225	21
(24.5)	(450)	24.5
28.5	300	28

STBY : REC

( ) : See note **BEFORE** adjustment

Note :

TRANSMITTING ON WARC BANDS

As supplied, the TS-530S will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required.

1. For all 3 bands : Break the line between the RF unit X44-1360-01, connector #6, Pin #1 (TOF terminal) and AF unit X49-1150-00, connector #7, Pin #4 (TOF terminal).
2. Or, for individual Bands : On the RF unit X44-1360-01 :

Band	Remove (or Cut) Part
10 MHz	D4
18 MHz	D5
24.5 MHz	D6

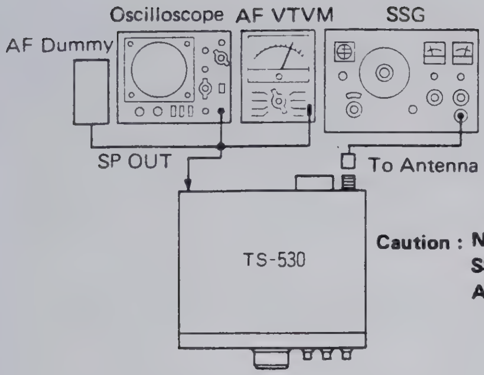
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
NB adjustment	AGC : FAST Disconnect the SSG output from the ANT terminal, and connect the noise generator output in it's place. Set the noise generator output level to S5~7.	Speaker	Rear panel	EXT. SP					
	NB : ON							The NB must provide adequate effect.	
					If adequate effect is not obtained, repeat the adjustment several times.				
	Reduce the noise generator output level to below the threshold of sensitivity. Turn the NB LEVEL control fully clockwise.							Noise must be blanked.	
	NB : OFF								
19. Neutralization trimmer adjustment	BAND : 28, +0.5 SHIFT : ON VFO :300 SG SW : ON STBY : SEND Tune the DRIVE, PLATE and LOAD	Power meter Sync'ed scope	Rear panel	ANT					Tune-up for MAX RF output.
	SG SW : OFF							RF output must be 0.	
	METER : ALC Set the ALC to maximum with the DRIVE control. Increase oscilloscope sensitivity.					Neutralization trimmer TC1	Minimum		
	Reduce oscilloscope sensitivity (5V/div.). SG SW : ON							The normal power must be obtained. The signal waveform must be normal.	
20. Side tone, semi-break-in function adjustment	Connect a power meter to the ANT terminal. Plug key into the rear Key jack to transmit in any band.	Oscilloscope AF VTVM	Rear panel	EXT. SP	AF	VR1	0.63V/8Ω		
	Operate the key.							The key must control RF output.	
	STBY : REC VOX : ON Operate the key							Semi-break-in operation should be available.	

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	AG : 300Hz ↕ 2700Hz				PLL	TC3	Adjust until the same level is obtained for both 300Hz and 2700Hz (equal audio rolloff).		
	MODE : LSB same as above					TC2			
	AG : 400Hz AG : 2600Hz							More than 1/2 with respect to the 1500Hz signal level observed on the scope.	
	After completing the above adjustment, readjust carrier suppression (see item 23.)				IF	VR4 TC1	Minimum	Less than –50dB	
	STBY : REC								
25. Speech processor adjustment	SG SW : OFF MODE : USB PROC : OFF METER : ALC Connect the AG (1500 Hz, 10mV) to the MIC input connector. STBY : SEND Adjust the MIC gain control until the meter indicates the maximum on-scale ALC reading.								
	PROC : ON				IF	VR3	Adjust until the same meter reading is obtained (max on-scale ALC).		
	STBY :REC PROC : OFF								

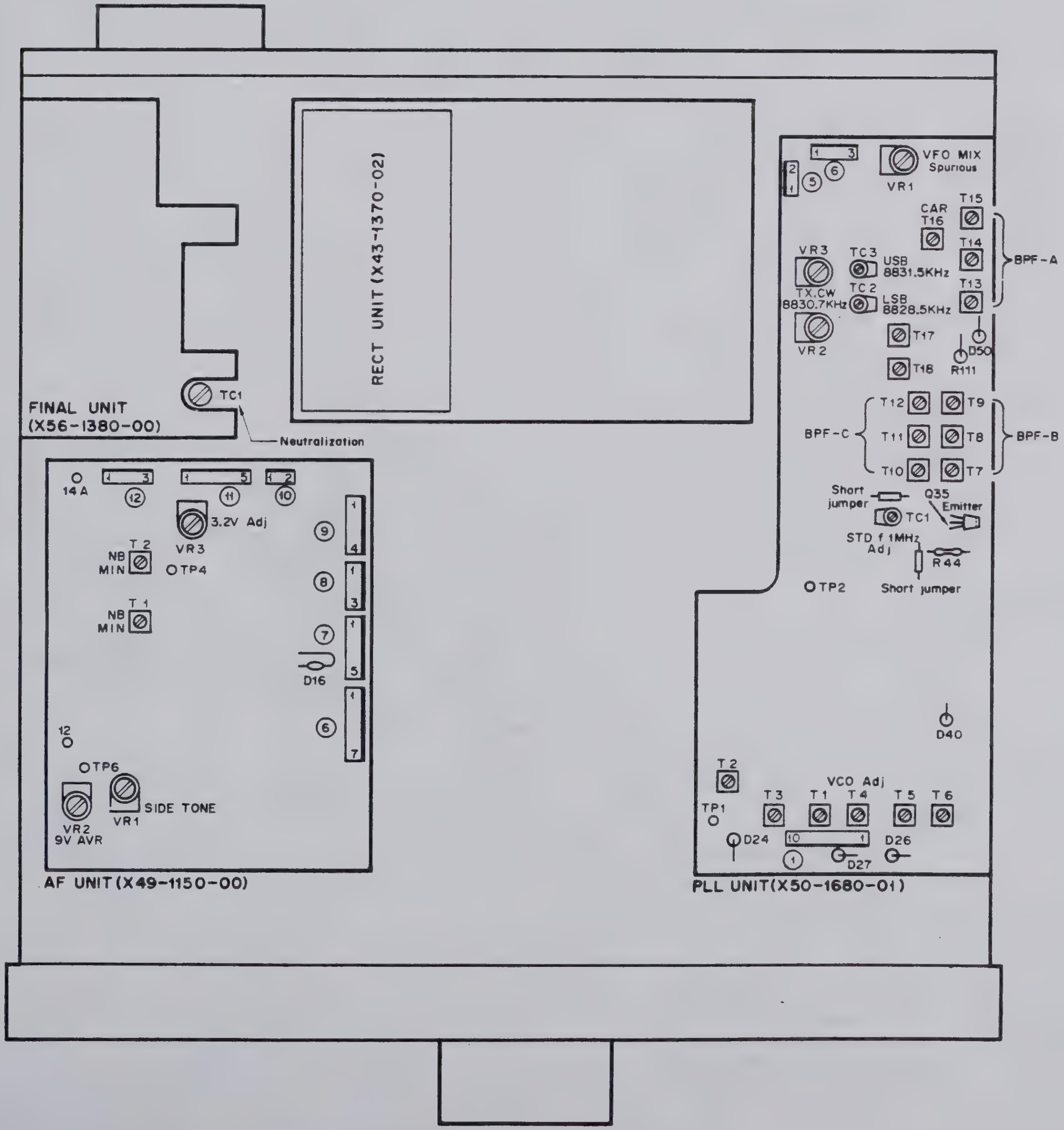
ADJUSTMENTS



Caution : **Never transmit when SSG is connected to the ANT terminal.**

Fig. 12 (12) IF AMP, (13) COIL PACK, (15) IF TRAP

▼ BOTTOM VIEW



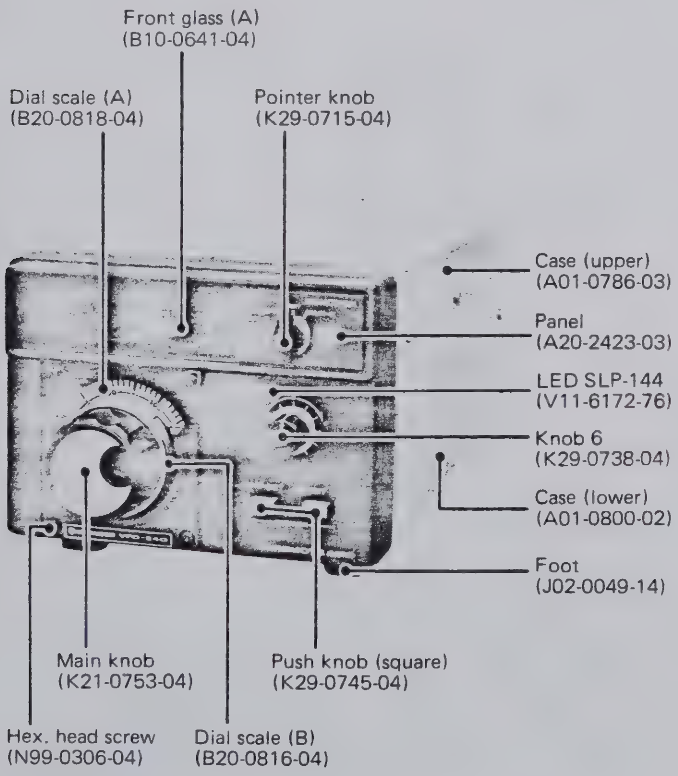
VFO-240

SPECIFICATIONS

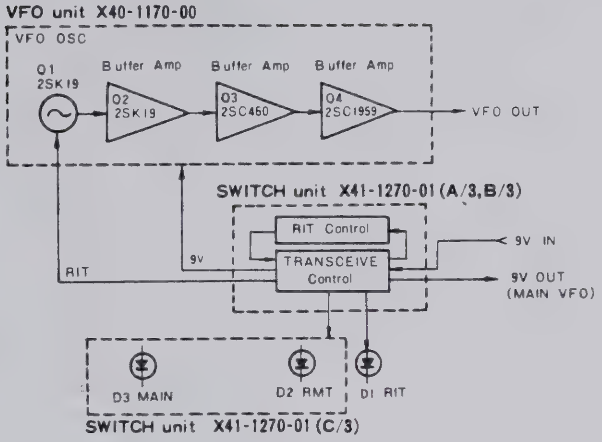
Oscillator frequency	5.50～6.00 MHz
Oscillator circuit	Clapp
Output voltage	0.2V ±1dB (across 470 ohm load)
Frequency stability	Within 100 Hz per 30 minutes after 3 minutes warm-up (at room temperature)
Solid-state complement	FET: 2 Transistor: 2 Diode: 6
Power source	From TS-530S or TS-830S
Dimensions	180 (7-1/8") W × 133 (5-1/4") H × 288 (11-5/16") D mm (inch)
Weight	2.9 kg (6.4 lbs)

* Specifications are subject to change for improvement without notice.

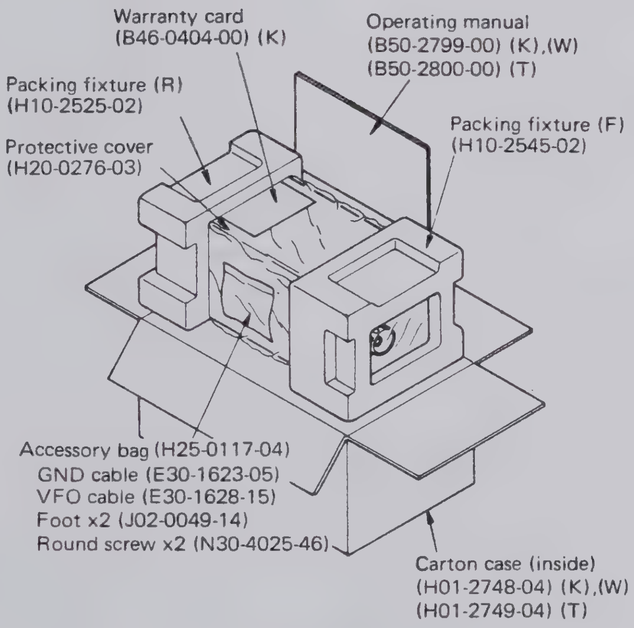
OUTSIDE VIEW



BLOCK DIAGRAM



PACKING



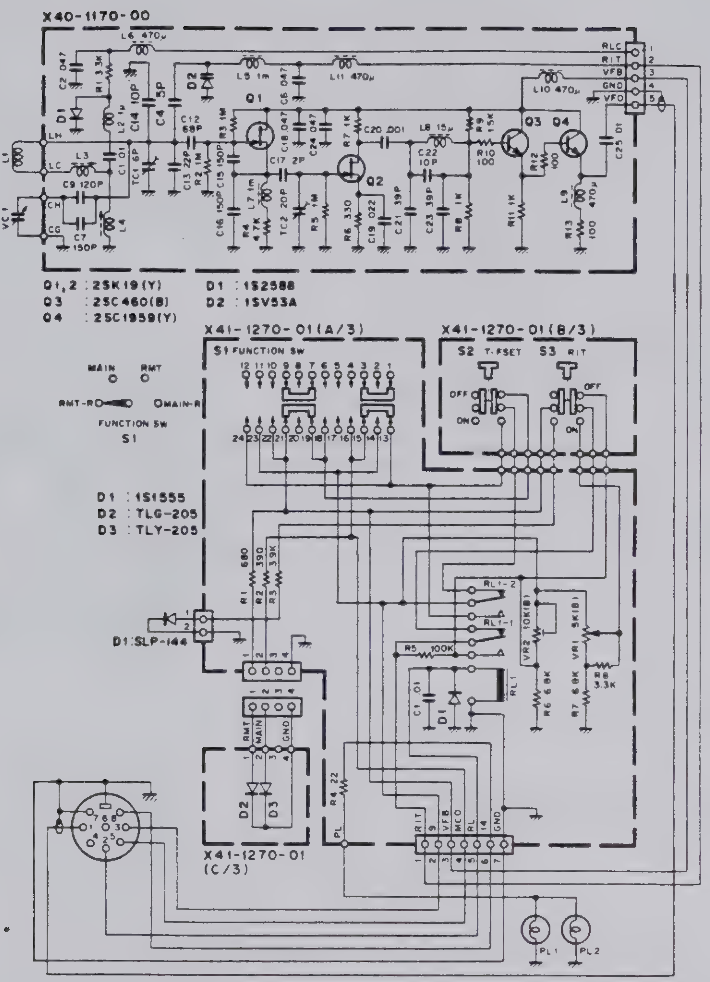
PARTS LIST

☆: New parts

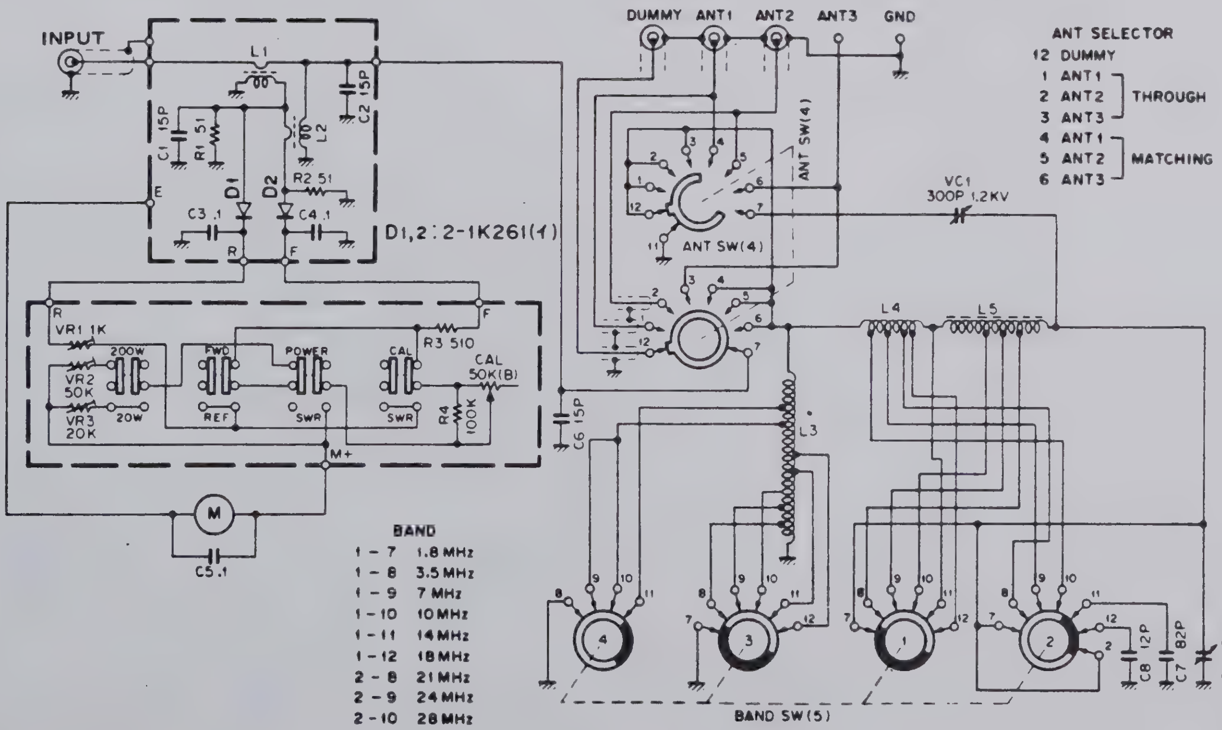
Ref. No.	Parts No.	Description		Re-marks
	VFO-240 GENERAL			
	A01-0786-03	Case (upper)		
	A01-0800-02	Case (lower)		☆
	A20-2423-03	Panel		☆
	B10-0641-04	Front glass (A)		☆
	B43-0658-04	Name plate	T	☆
	B43-0659-04	Name plate	K,W	☆
	B46-0404-00	Warranty card	K	
	B50-2799-00	Operating manual	K,W	☆
	B50-2800-00	Operating manual	T	☆

VFO-240/AT-230

VFO-240
SCHEMATIC DIAGRAM

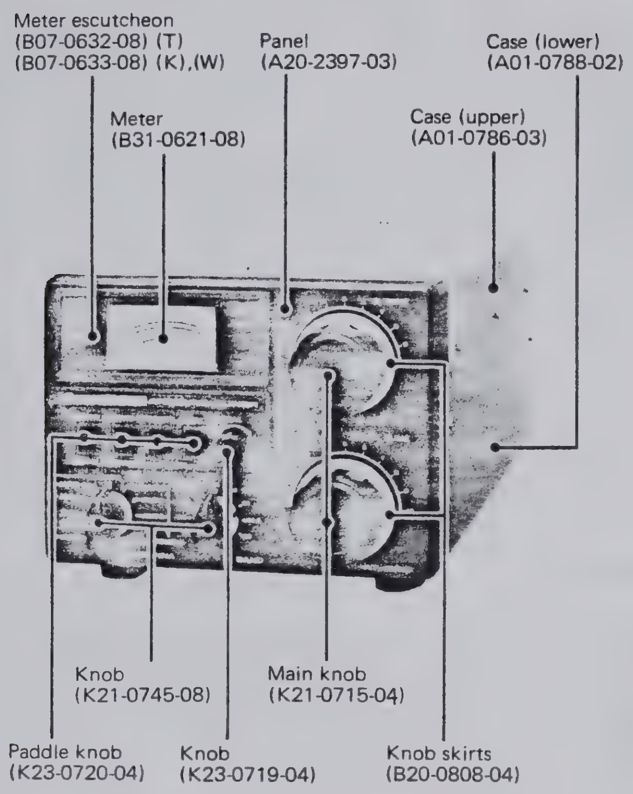


AT-230
SCHEMATIC DIAGRAM



AT-230

OUTSIDE VIEW



ADJUSTMENTS

1. INSTRUMENTS

1) Terminated Power Meter

1. Frequency range:	50 MHz or more
2. Input impedance:	50Ω
3. Power range:	20W and 200W

2) HF Transmitter or Transceiver

1) Output:	100W CW
Variable to 10W.	
Example:	TS-530, TS-830S

2. POWER METER ADJUSTMENT

1) Test Equipment Connection

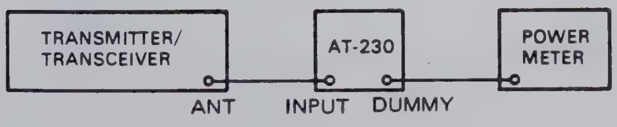


Fig. 1

2) Adjustment

1. Connect as in Fig. 1.
2. Unless otherwise specified, controls should be set as follows:

ANT SW	DUMMY
BAND SW	14
200W/20W SW	200W
FWD/REF SW	FWD
POWER/SWR SW	POWER
CAL/SWR SW	SWR

Tune up the transceiver at 14.175 MHz

3. Adjust the transceiver for 100W output at the power meter (adjusted by the carrier level control)
Adjust VR2 on the switch unit for a meter reading of 100 on the AT-230.

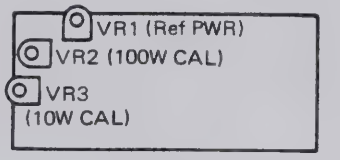


Fig. 2

4. As in step 3, lower transceiver output to 10W and adjust VR3 for a meter indication of 10 on the 20W scale

3. CALIBRATION OF REF POWER

1) Connection

As in Fig. 1

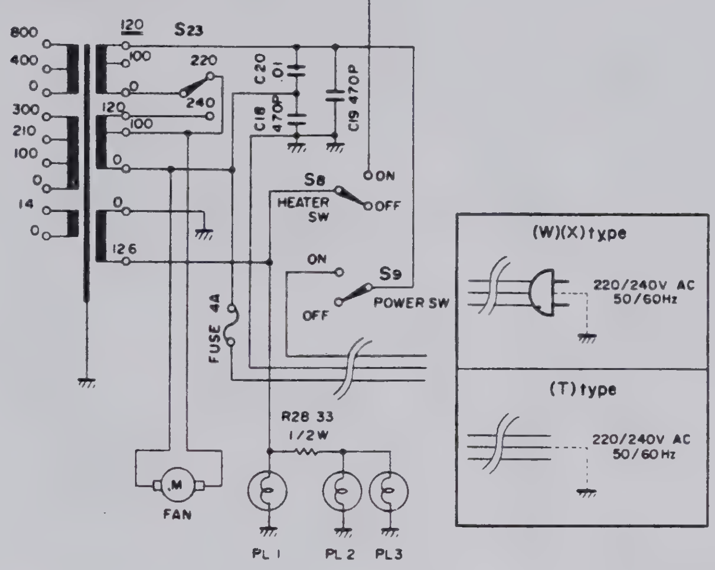
2) Adjustment

1. Set controls as described in 2.2
Confirm 100W CW output reading
2. Unkey the transceiver and reverse the coaxial cable between the INPUT and DUMMY terminals on the AT-230. Move the FWD/REF switch to the REF position
3. Transmit and adjust VR1 for previously confirmed 100W reading

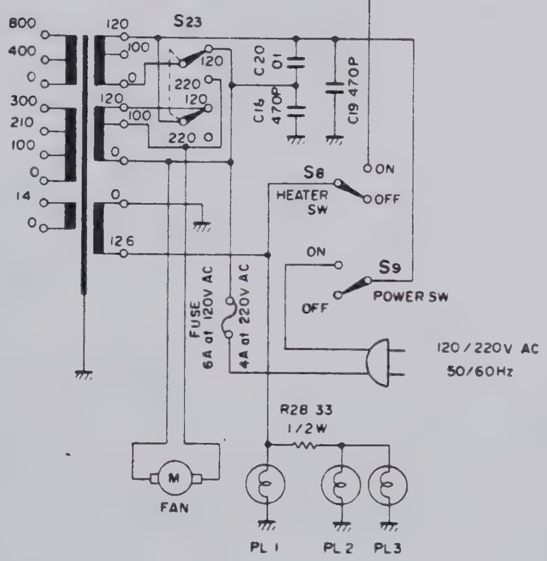
SCHEMATIC ABBREVIATION

Connector No.	Terminal name	
⑧	RLT	+ 9V on transmit
	RLR	+ 9V on receive
	–6	B –6V
⑨	ALC	ALC output from Q31
	RLT	+ 9V when transmit
	RLR	+ 9V when receive
	RL	Relay voltage
⑩	RAL	External ALC input remote socket
	VR2	Arm of TX bias control
⑪	NBV	Top of noise blanker VR
	NBS	Noise blanker SW
	9	B + 9V
	PRS	Processor SW
	RF1	Top of RF gain control
⑫	NSG	Noise blanker gate signal
	RB2	Receiver bias for IF unit
	14A	14V input
	G14	14V input (ground)
	FG	Bias for control grid of 6146B
Final unit (X56-1380-00)		
	DRV	Drive input
	FG	Control grid bias
	H	Heater voltage AC12.3V
	IPM	IP meter voltage
	SG	Screen grid voltage
Rectifier unit (X43-1370-02)		
	800	B + 800V
	HV	High voltage signal to METER
	300B	B + 300V
	210B	B + 210V
	210A	B + 210V
	–C	Common B– approx. –100V
	12	Screen grid cut off voltage
	SG2	Screen grid voltage
	TUN	Screen grid voltege for TUN

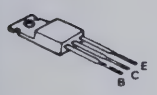
TS-530S (T)(W)(X)Type



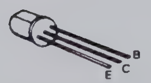
TS-530S (M)Type



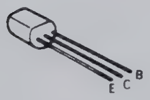
2SA473



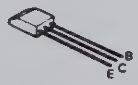
2SA562



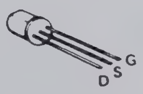
2SA778A 2SC1775
2SA1015 2SC1815
2SC945 2SC1923
2SC1515 2SC1959
2SC1675 2SC2240



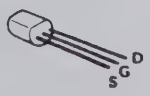
2SC460



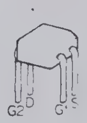
2SK19



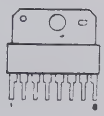
2SK125
2SK30A



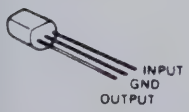
3SK73



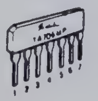
MB3712



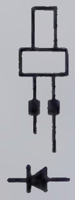
NJM78L05A



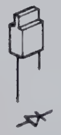
µPC1158H2



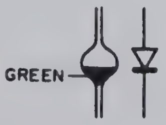
SLP-144



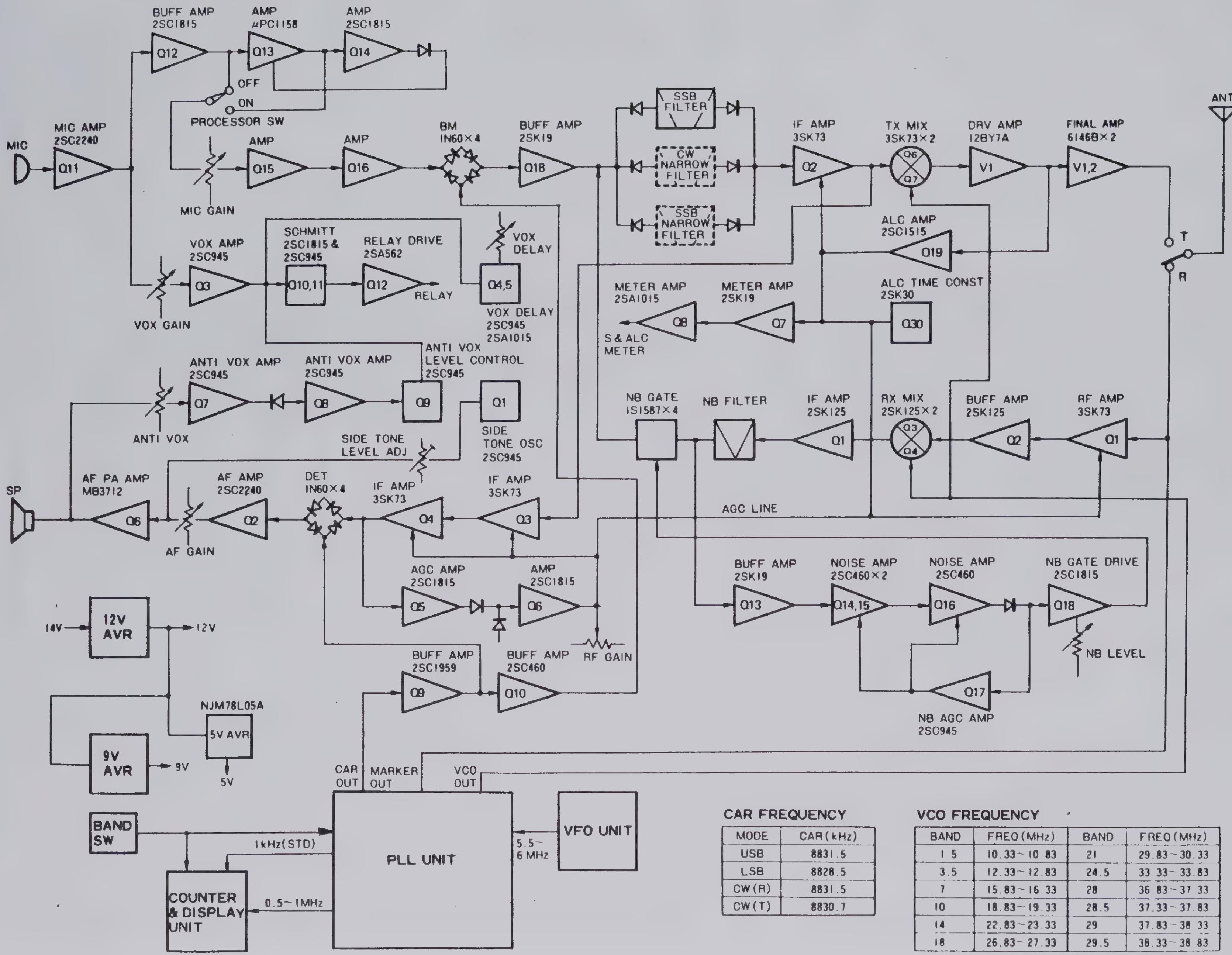
TLR-205



MV-13



BLOCK DIAGRAM



CAR FREQUENCY

MODE	CAR (kHz)
USB	8831.5
LSB	8828.5
CW (R)	8831.5
CW (T)	8830.7

VCO FREQUENCY

BAND	FREQ (MHz)	BAND	FREQ (MHz)
1.5	10.33~10.83	21	29.83~30.33
3.5	12.33~12.83	24.5	33.33~33.83
7	15.83~16.33	28	36.83~37.33
10	18.83~19.33	28.5	37.33~37.83
14	22.83~23.33	29	37.83~38.33
18	26.83~27.33	29.5	38.33~38.83

SPECIFICATIONS

GENERAL

Frequency Range	160 m Band 1.8~2.0 MHz 80 m Band 3.5~4.0 MHz 40 m Band 7.0~7.3 MHz * 30 m Band 10.1~10.15 MHz (10.0 MHz WWV) 20 m Band 14.0~14.35 MHz * 17 m Band 18.068~18.168 MHz 15 m Band 21.0~21.45 MHz * 12 m Band 24.89~24.99 MHz 10 m Band 28.0~29.7 MHz
Modes	SSB/CW
Frequency Stability	Within 1 kHz during the first hour after 1 minute of warmup. Within 100 Hz during any 30 minute period after warmup.
Power Requirement	120V AC (220,240V modifiable) 50/60 Hz : (K) 120/220V AC (Selectable) 50/60 Hz : (M) 220/240V AC (Selectable) 50/60 Hz : (T)(W)(X)
Power Consumption	Transmit : 295 watts Receive : 27 watts (with heaters off)
Dimensions	333 (13.3) x 133 (5.3) x 333 (13.3) mm (inch)
Weight	12.8 kg (28.2 lbs)

(K) : USA
(T) : Britain
(W) : Europe
(X) : Australia
(M) : General market

TRANSMITTER

* Final Power Input	220W PEP for SSB operation 180W DC for CW operation
Audio Input Impedance	500Ω~50kΩ
RF Output Impedance	50Ω~75Ω
Carrier Suppression	Better than 40 dB
Sideband Suppression	Better than 50 dB
Spurious Radiation	Better than 60 dB
Harmonic Radiation	Better than 40 dB
Audio Freq. Response	400 to 2,600 Hz within –6 dB

RECEIVER

Receiver Sensitivity	0.25μV at 10 dB S + N/N
Image Ratio	Better than 60 dB
IF Rejection	Better than 70 dB
Receiver Selectivity SSB/CW	2.4 kHz (–6 dB), 4.2 kHz (–60 dB) CW Optional Filter YK-88C 500 Hz (–6 dB), 1.5 kHz (–60 dB) YK-88CN 270 Hz (–6 dB), 1.1 kHz (–60 dB) SSB Optional Filter YK-88SN 1.8 kHz (–6 dB), 3.3 kHz (–60 dB)
Audio Output Impedance	8~16Ω
Audio Output	1.5 W (8Ω)

* Will transmit on the new 30, 17, and 12 meter bands.
Diodes installed for preventing accidental transmission before government Amateur authorization.

NOTE : The circuit and ratings may change without notice due to developments in technology.

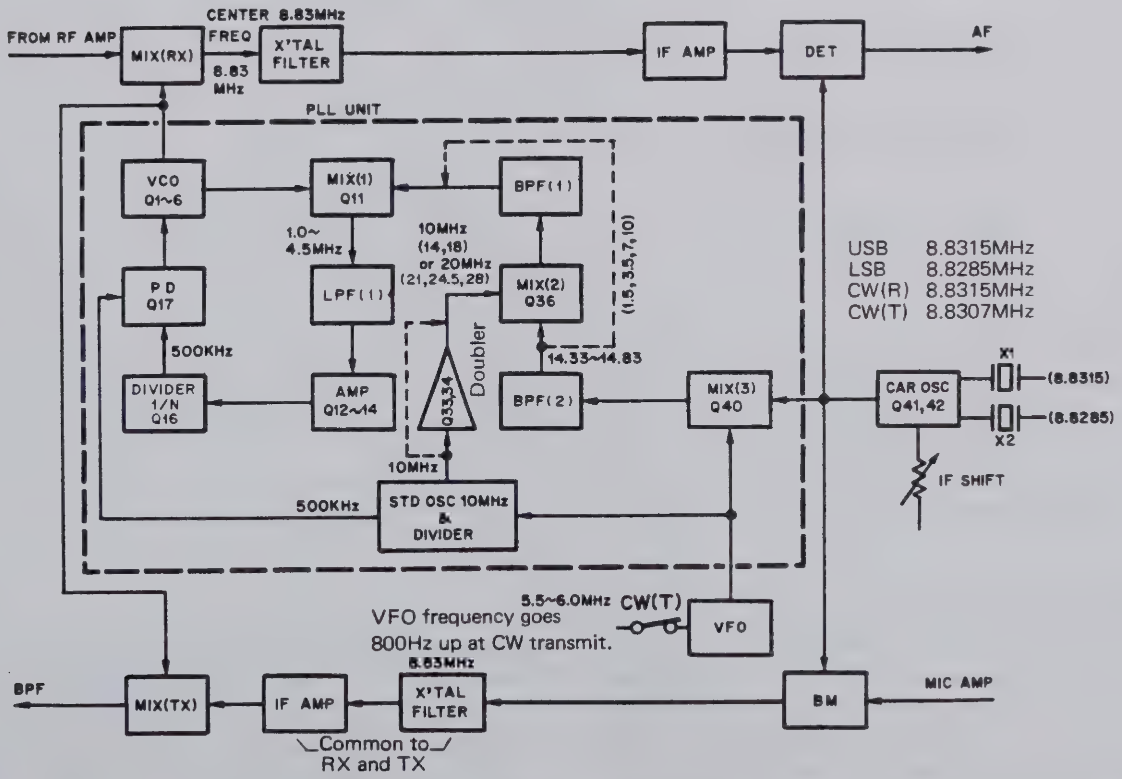
CIRCUIT DESCRIPTION

This is mixed with the VCO output for each band by MIX (1) to a frequency given in **Table 4**, which is then routed through LPF (1), amplified, and wave-shaped to a digital signal. A programmable divider divides this signal into a 500 kHz output. This programmable divider is preset, as shown in **Table 4**, by the BCD signal which is counter-generated from information coming from the band switch. The phase comparator used is a Motorola MC4044P. The loop filter is made of completely discrete components to minimize VCO spurious content.

Six VCOs cover all bands. If the PLL unlocks for any reason, it will be detected from the phase comparator output. This will turn off the VCO output to prevent spurious radiation and, at the same time, the display will be blanked to inform the operator of unlock status.

BAND	RX, Tx frequency (MHz)	VCO (MHz)	MIX (1) input (MHz)	MIX (1) output (MHz)	Division ratio	DCBA
1.5	1.5 ~2.0	10.33 ~10.83	14.33 ~14.83	4.0	1/8	1 0 0 0
3.5	3.5 ~4.0	12.33 ~12.83	14.33 ~14.83	2.0	1/4	1 1 0 0
7	7.0 ~7.5	15.83 ~16.33	14.33 ~14.83	1.5	1/3	1 1 0 1
10	10.0 ~10.5	18.83 ~19.33	14.33 ~14.83	4.5	1/9	0 1 1 1
14	14.0 ~14.5	22.83 ~23.33	24.33 ~24.83	1.5	1/3	1 1 0 1
18	18.0 ~18.5	26.83 ~27.33	24.33 ~24.83	2.5	1/5	1 0 1 1
21	21.0 ~21.5	29.83 ~30.33	34.33 ~34.83	4.5	1/9	0 1 1 1
24.5	24.5 ~25.0	33.33 ~33.83	34.33 ~34.83	1.0	1/2	1 1 1 0
28	28.0 ~28.5	36.83 ~37.33	〃	2.5	1/5	1 0 1 1
28.5	28.5 ~29.0	37.33 ~37.83	〃	3.0	1/6	1 0 1 0
29	29.0 ~29.5	37.83 ~38.33	〃	3.5	1/7	1 0 0 1
29.5	29.5 ~30.0	38.33 ~38.83	〃	4.0	1/8	1 0 0 0

Table 3 Frequency chart



VFO frequency goes 800Hz up at CW transmit.

Common to RX and TX

Fig. 1 TS-530 Frequency configuration

CIRCUIT DESCRIPTION

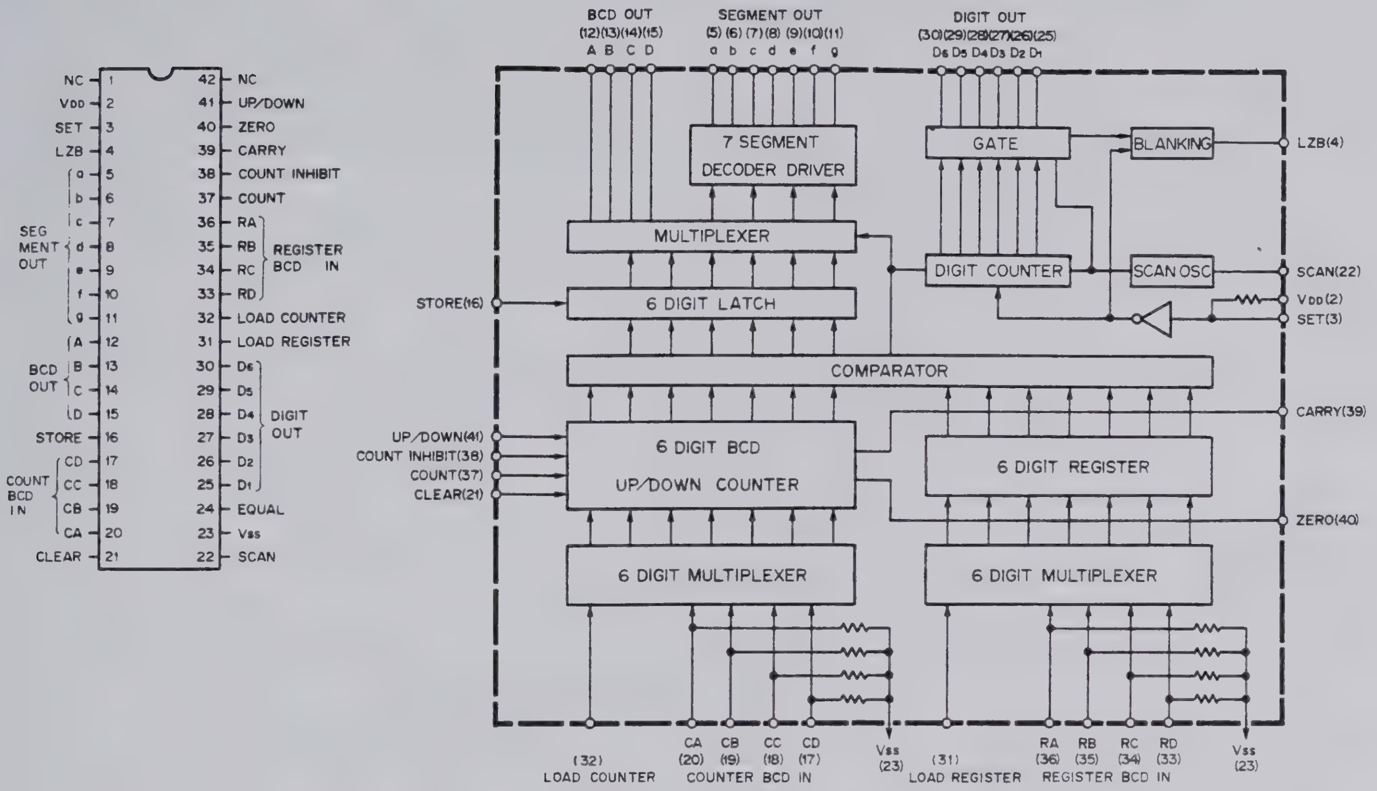

NC 1
VDD 2
SET 3
LZB 4
SEG MENT OUT a 5, b 6, c 7, d 8, e 9, f 10, g 11
BCD OUT A 12, B 13, C 14, D 15
STORE 16
COUNT BCD IN CD 17, CC 18, CB 19, CA 20
CLEAR 21
42 NC
41 UP/DOWN
40 ZERO
39 CARRY
38 COUNT INHIBIT
37 COUNT
36 RA, 35 RB, 34 RC, 33 RD REGISTER BCD IN
32 LOAD COUNTER
31 LOAD REGISTER
30 D6, 29 D5, 28 D4, 27 D3, 26 D2, 25 D1 DIGIT OUT
24 EQUAL
23 Vss
22 SCAN
BCD OUT (12)(13)(14)(15) A B C D
SEGMENT OUT (5) (6) (7) (8) (9) (10) (11) a b c d e f g
DIGIT OUT (30)(29)(28)(27)(26)(25) D6 D5 D4 D3 D2 D1
7 SEGMENT DECODER DRIVER
GATE
BLANKING
LZB(4)
MULTIPLEXER
DIGIT COUNTER
SCAN OSC
SCAN(22)
VDD(2)
SET(3)
STORE(16)
6 DIGIT LATCH
COMPARATOR
CARRY(39)
UP/DOWN(41)
COUNT INHIBIT(38)
COUNT(37)
CLEAR(21)
6 DIGIT BCD UP/DOWN COUNTER
6 DIGIT REGISTER
ZERO(40)
6 DIGIT MULTIPLEXER
6 DIGIT MULTIPLEXER
(32) LOAD COUNTER
CA CB CC CD (20) (19) (18) (17) COUNTER BCD IN
Vss (23)
(31) LOAD REGISTER
RA RB RC RD (36) (35) (34) (33) REGISTER BCD IN
Vss (23)

Fig. 4 TS5070P (Counter unit, Q5)

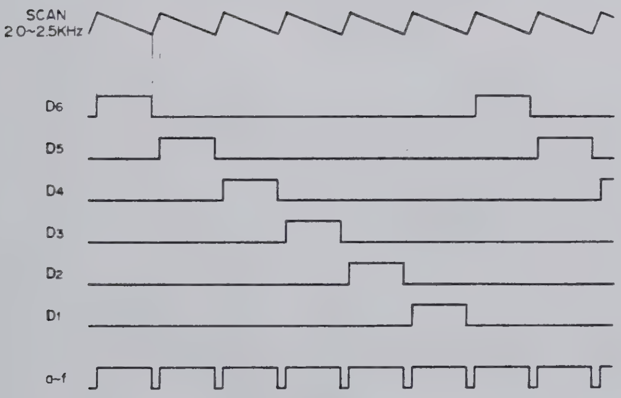
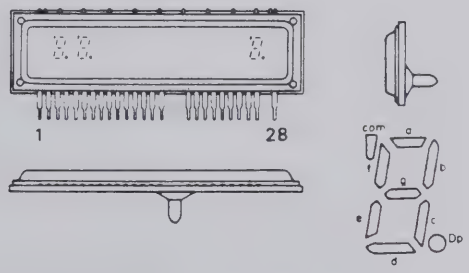


Fig. 5 TC5070P Timing chart



PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CONNECTION	F	N_C	G_9	N_C	N_C	G_8	g	f	G_7	e	d	G_6	N_C	N_C
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	G_5	N_P	N_P	G_4	D_P	G_3	c	b	G_2	a	COM	G_1	N_P	F

Fig. 6 Indicating tube 9-BT-12

Q5 (TC5070P) is a presettable, 6-digit BCD counter which incorporates a 6-digit latch, 6-digit dynamic drive digital counter, and 7-segment decoder/driver. Band information supplied from the RF unit is applied to a diode matrix to preset the 100 kHz, 1 MHz and 10 MHz digits. Preset values are given in **Fig. 3**. For instance, to preset 14.000 MHz, with a 500 kHz counter input signal, the 10 MHz value is preset to 1, 1 MHz to 3, and 100 kHz to 5, and the 500 kHz counter input signal is subtracted from 14.000 MHz. (If no counter input signal were present, 13.500 MHz would be displayed). Q5 supplies the display tube drivers with 7-segment information and dynamic drive control signals to light the fluorescent display tube.

In the counter unit, a diode matrix generates frequency division information and supplies the PLL unit with this information. If the PLL unlocks, a BLK (Blanking Low) signal will be applied to the digit driver IC (Q11) to blank the fluorescent display tube.

CIRCUIT DESCRIPTION

2. IF SHIFT operation

The IF SHIFT circuit shifts the passband of the IF circuit without changing the receiving frequency. The relative position of the passband of the IF filter to the received signal is shifted when the IF SHIFT control is turned as shown in **Fig. 7**. The IF SHIFT circuit block diagram is shown in **Fig. 8**.

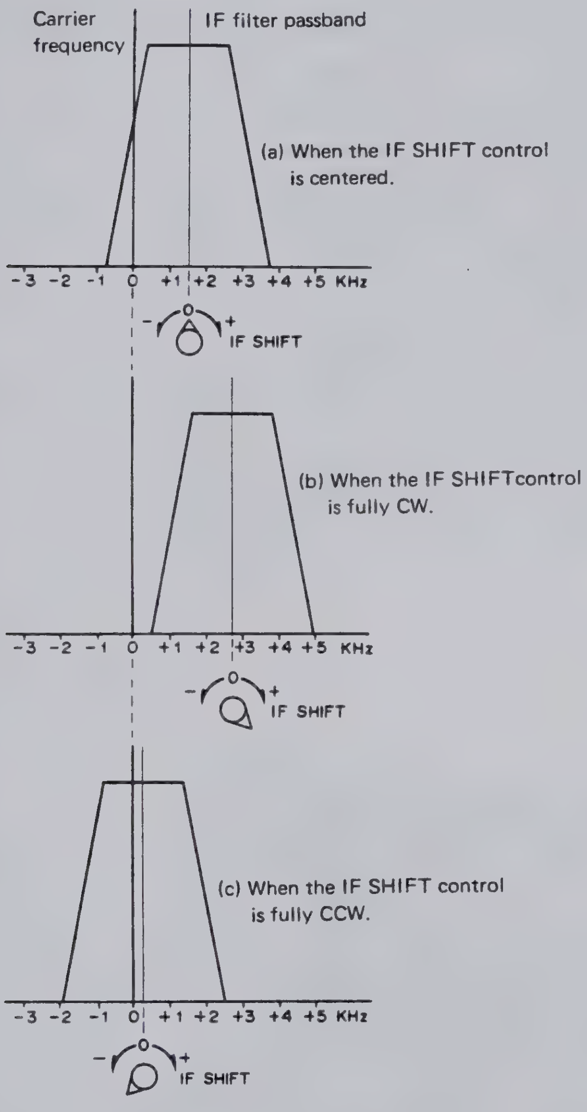

Carrier frequency
IF filter passband
(a) When the IF SHIFT control is centered.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT
(b) When the IF SHIFTcontrol is fully CW.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT
(c) When the IF SHIFT control is fully CCW.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT

Fig. 7 IF SHIFT operation (for USB mode)

Frequencies within the PLL loop satisfy the following relationship.

$$N \cdot 500\,\text{kHz} = f_{BPF1} - f_{VCO} \qquad (1)$$

where N : divisor of programmable divider
500 kHz : phase reference frequency
f_{BPF1} : input frequency to MIX (1)
f_{VCO} : VCO frequency

For example, in the case of 14 MHz reception, f_{BPF1} is given by eq. (1) as

$$f_{BPF1} = 10\,\text{MHz} + f_{BPF2} \qquad (2)$$

where 10 MHz : band setting frequency

$$f_{BPF2} = f_{VFO} + f_{CAR} \qquad (3)$$

where f_{VFO} : VFO frequency
f_{CAR} : carrier frequency

By substituting eq. (3) into eq.(2) and eq.(2) into eq.(1)

$$f_{VCO} = 10\,\text{MHz} + f_{VFO} + f_{CAR} - N \cdot 500\text{kHz}$$

$$\therefore f_{CAR} = f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})$$

Assuming that f_{VFO} is constant, when f_{CAR} is varied by $\pm \Delta f$,

$$\begin{aligned} f_{CAR} \pm \Delta f &= [f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})] \pm \Delta f \\ &= (f_{VCO} \pm \Delta f) + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO}) \end{aligned}$$

Thus, f_{VCO} varies by $\pm \Delta f$ as f_{CAR} is varied by $\pm \Delta f$.

The receiving frequency, f_R is given by

$$f_R = f_{VCO} - f_{CAR} \qquad (4)$$

Therefore, when f_{CAR} is shifted by $+\Delta f$, receiving frequency f'_R is given by

$$\begin{aligned} f'_R &= (f_{VCO} + \Delta f) - (f_{CAR} + \Delta f) \\ &= f_{VCO} - f_{CAR} \qquad (5) \end{aligned}$$

From equations (4) and (5),

$$f_R = f'_R$$

Thus the receiving frequency does not vary even if f_{CAR} is varied. However,

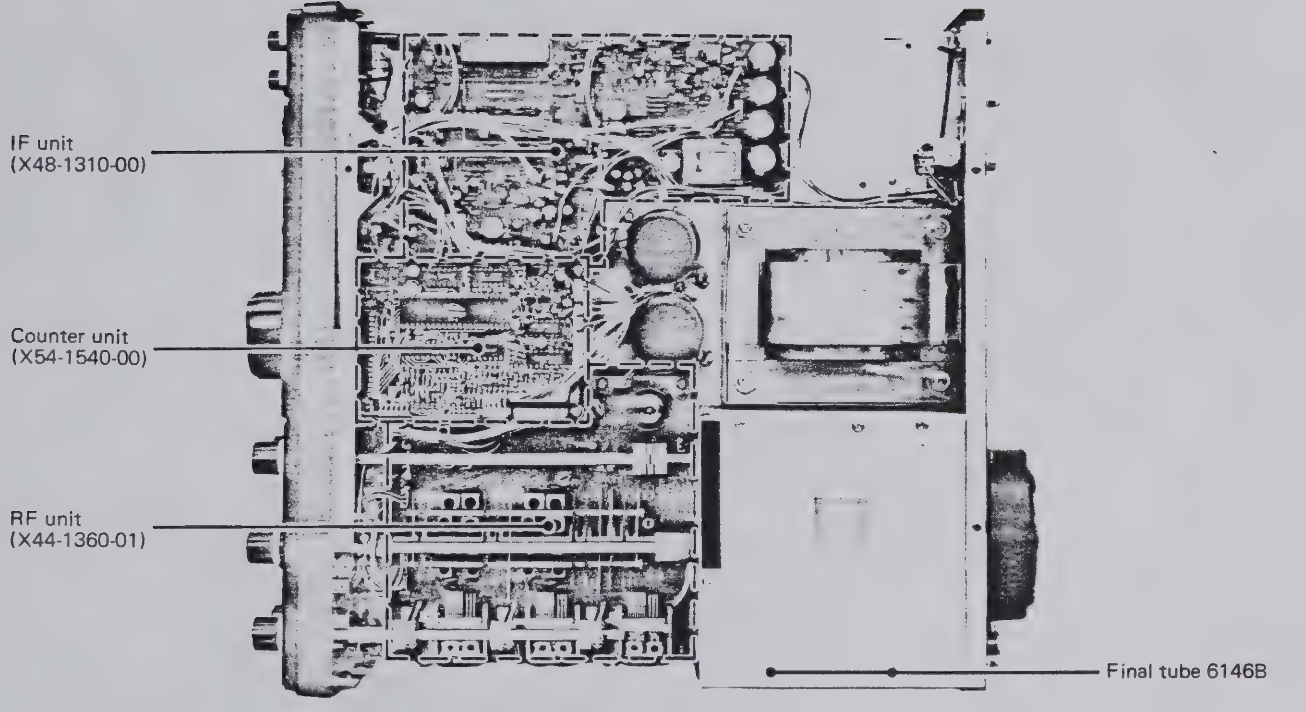
$$f_R = f_{VCO} - \text{IF frequency}$$

so the IF frequency varies as f_{VCO} varies.

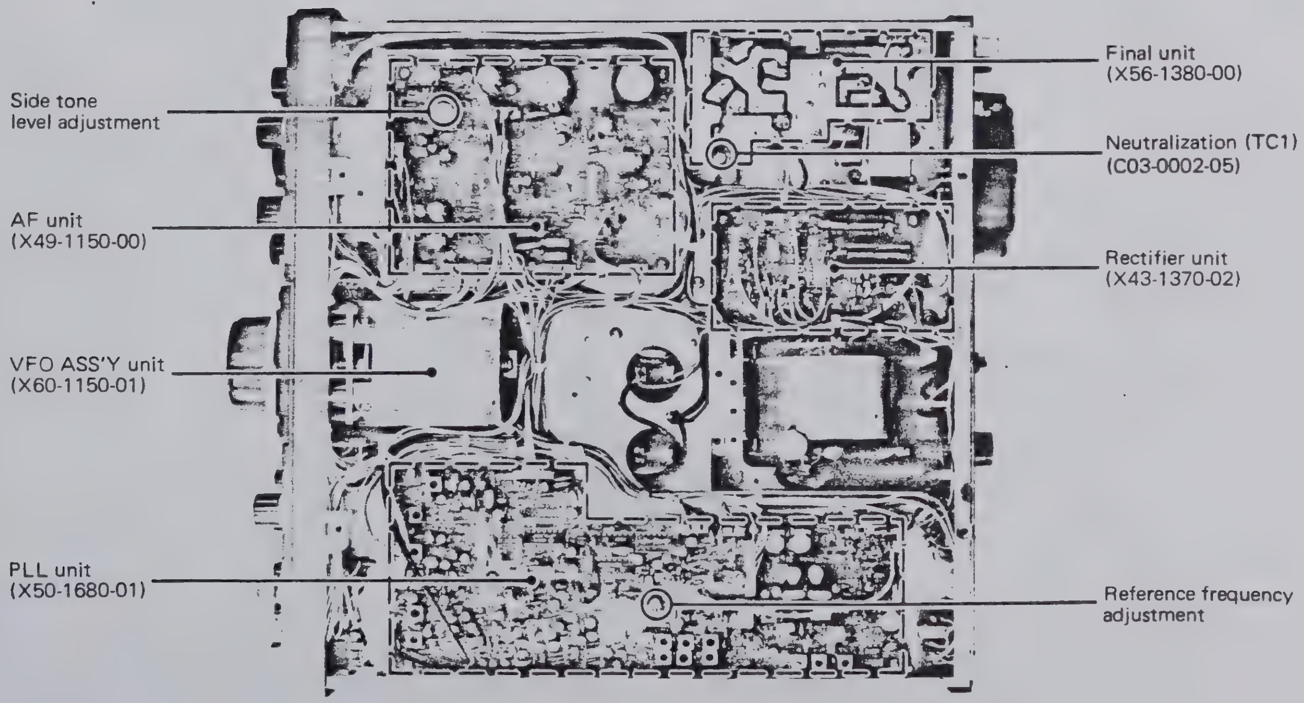
This means that the relative position of the IF filter passband to the carrier position (of the received signal) is shifted by the same amount as the f_{VCO} variation.

INSIDE VIEWS

TOP VIEW

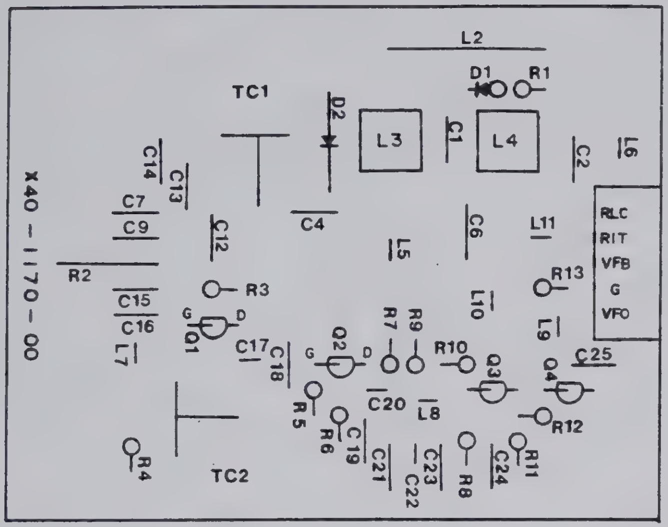


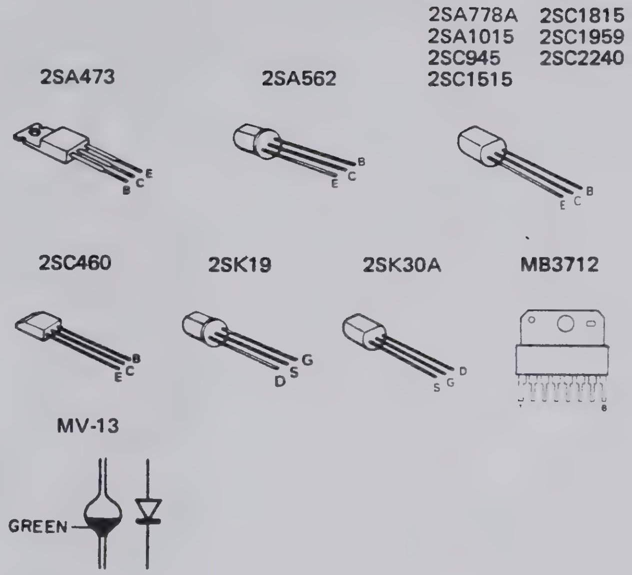
BOTTOM VIEW



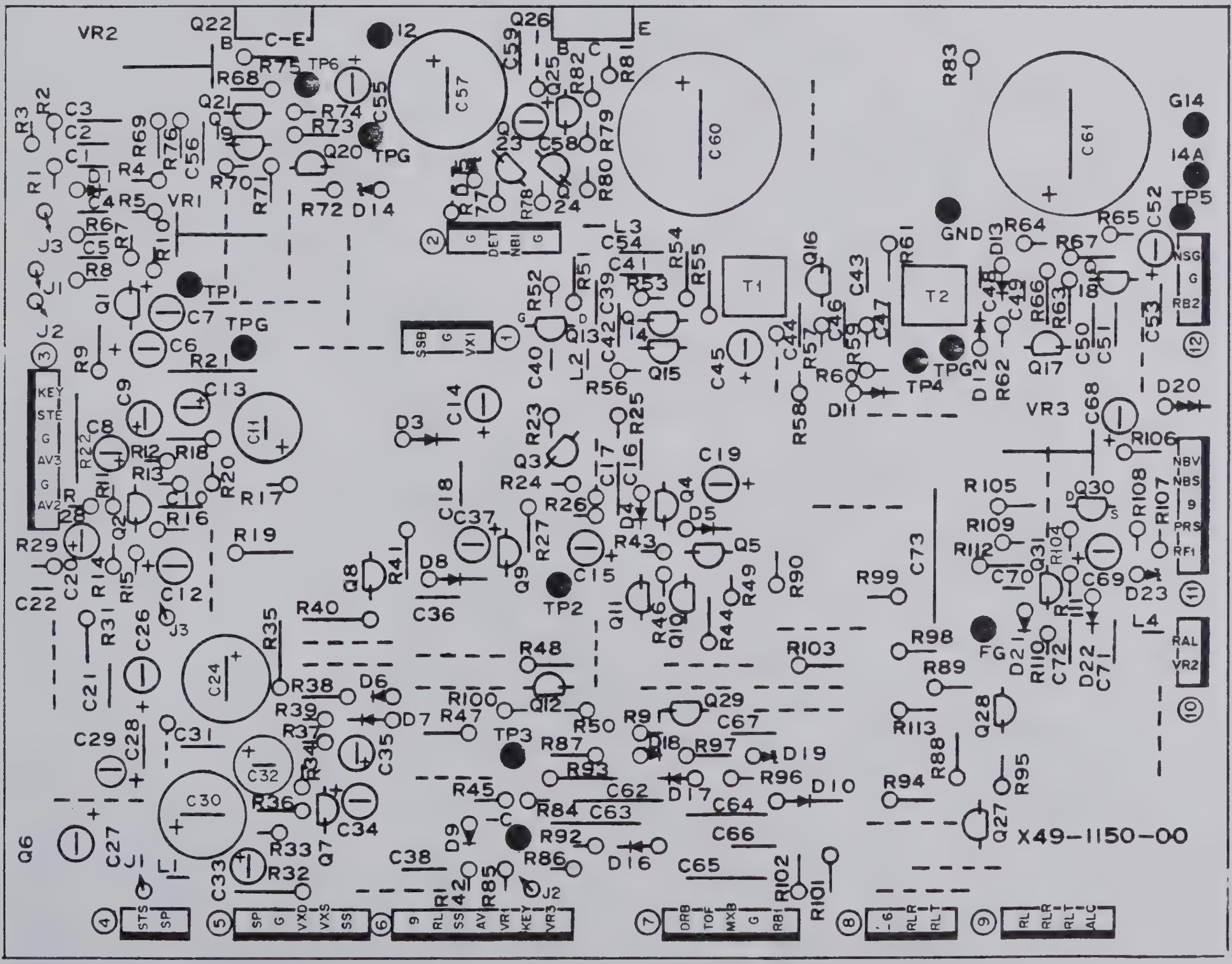
TS-530S PC BOARD VIEWS

▼ VFO UNIT (X40-1170-00) View from component side



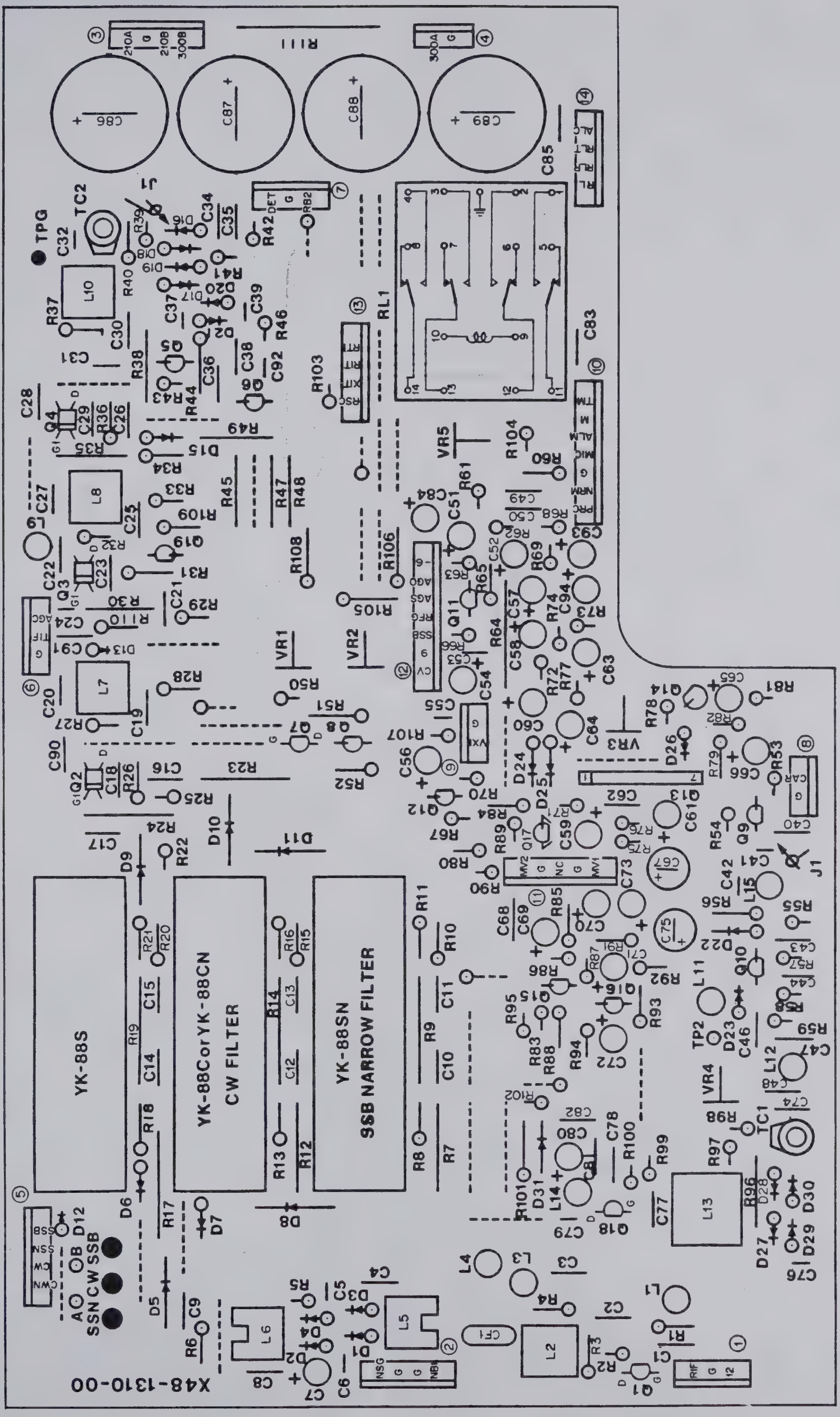


▼ AF UNIT (X49-1150-00) View from component side

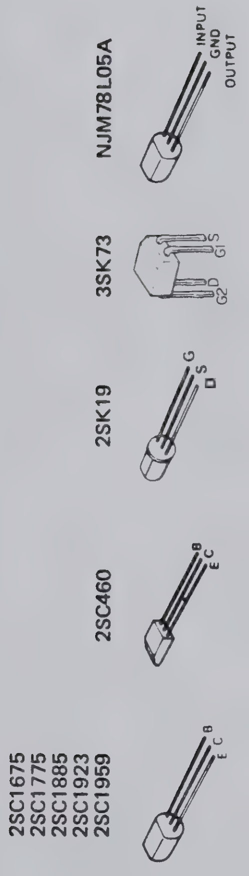


TS-530S PC BOARD VIEW

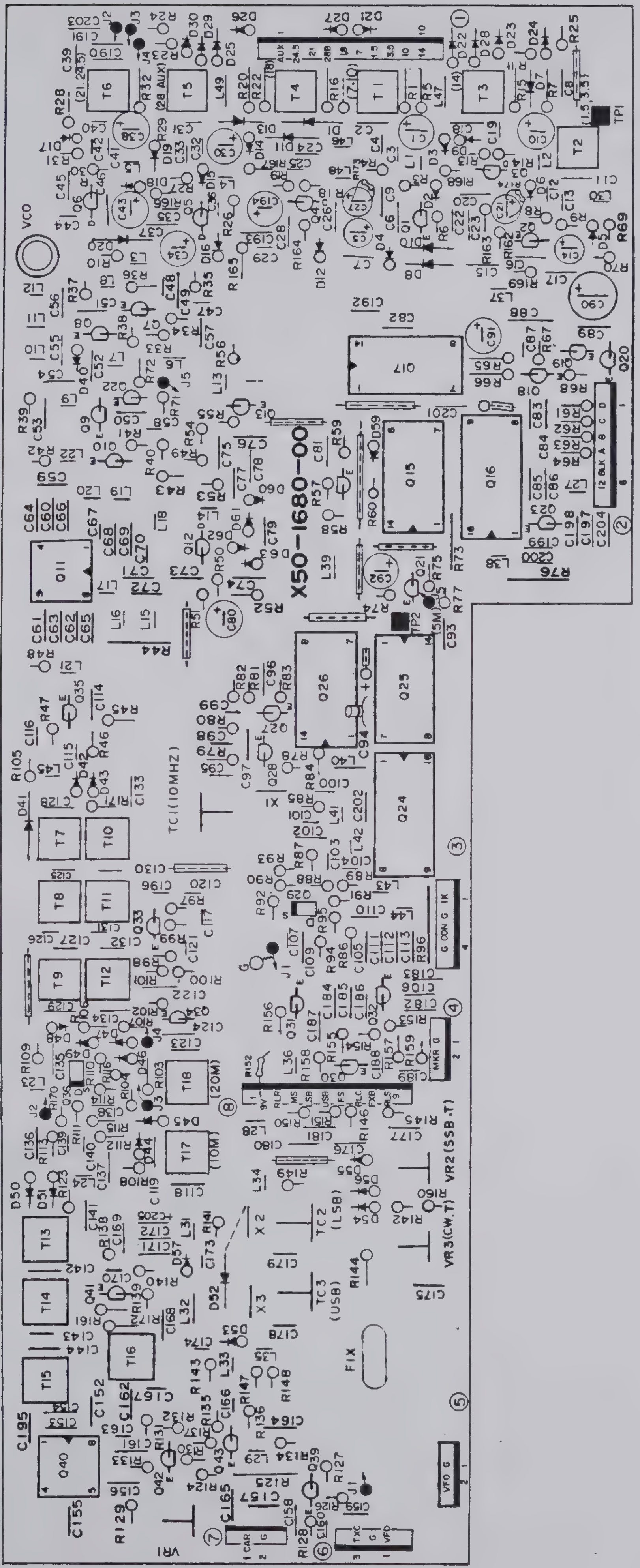
▼IF UNIT (X48-1310-00) View from component side



TS-530S PC BOARD VIEW

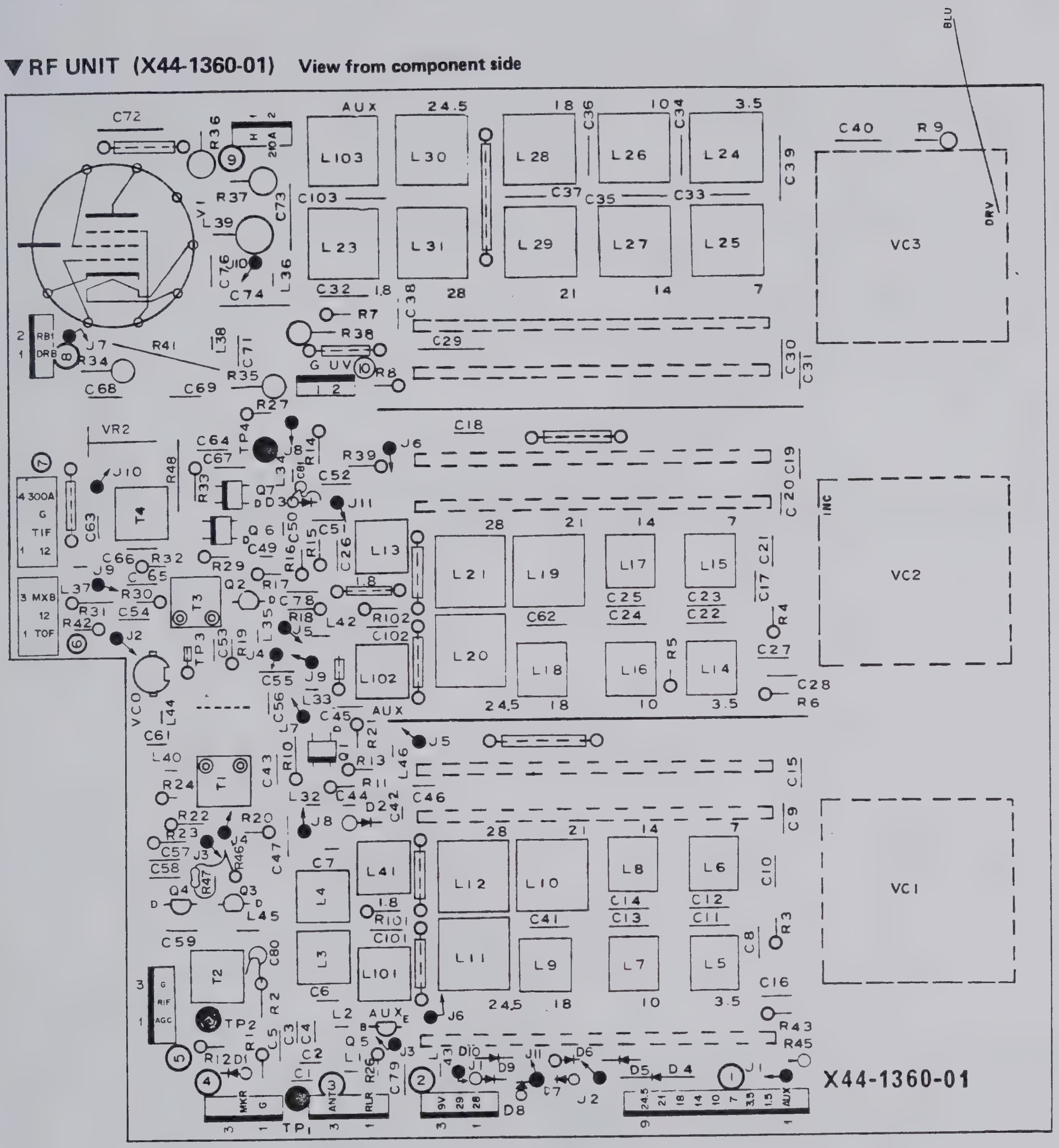


▼ PLL UNIT (X50-1680-01) View from component side



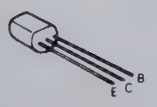
S-530S PC BOARD VIEW

▼RF UNIT (X44-1360-01) View from component side

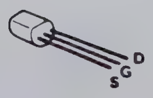


D1, 6, 7 : 3SK73(GR) Q2~4 : 2SK125 Q5 : 2SC1815(Y) D1 : 1S1587 D2, 3 1S2588 D4~10 : 1S1555 V1 : 12BY7A

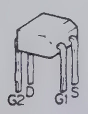
2SC1815



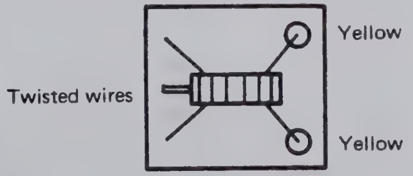
2SK125



3SK73



Attachment method of T1, T2



PARTS LIST

Note 1:
K: U.S.A. T Britain W. Europe X: Australia

Note 2:
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example electrolytic, tantalum, mylar, temp; coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration Resistors not otherwise detailed are carbon type (1/4W or 1/8W).
Order carbon resistors and capacitors according to the following example:

A carbon resistor's part number is RD14BY 2E222J.

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

RESISTOR

1. **Type of the carbon resistor**

RD14BY
RD14BB (small size)

RD14CY
RD14CB (small size)

2. **Wattage**

1W → 3A 3W → 3F 5W → 3H
2W → 3D 4W → 3G

3' = CC45 ○ ○ ...
Ceramic capacitor (type I) temperature coeff. capacitor 1' 3'

1st word (Color)	C (Black)	L (Red)	P (Orange)	R (Yellow)	S (Green)	T (Blue)	U (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

3 = CK45 ○
Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

6 = Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10 μF −10 ~ +50 Less than 4.7 μF −10 ~ + 75

Less than 10 pF

Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

Abbreviation		Abbreviation	
Cap.	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

3. **Resistance value**

② ② ② → means 22 × 10² = 2200Ω (2.2 kΩ)

Example 221 → 220Ω 223 → 22 kΩ 225 → 2.2 MΩ
222 → 2.2 kΩ 224 → 220 kΩ

4. **Tolerance**

J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

CC	45	TH	1H	220	J
1'	2	3'	4	5	6

Type II

CK	45	F	1H	103	Z
1	2	3	4	5	6

1 = Type ..... ceramic, electrolytic, etc
2 = Shape ..... round, square, etc.
3 = Temp range
3' = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

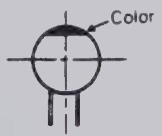
Ex. **CC45TH** = −470 ±60 ppm/°C

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

5 = Capacitor value

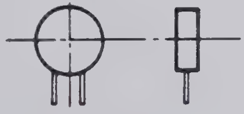
Example. 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001μF
103 → 0.01 μF

CC45



Type I

CK45



Type II

TS-530 SEMICONDUCTOR

☆: New parts

Item	Name	Parts No.	Remarks
Diode	1N60	V11-0051-05	
	1S1007	V11-4160-66	
	1S1555	V11-0076-05	
	1S1587	V11-0370-05	
	1S2588	V11-0414-05	
	V03C	V11-0290-05 200V 1.3A	
	V06B	V11-0219-05 100V 1.1A	
	V06E	V11-0285-05 400V 1.1A	
	V08J	V11-0282-05 800V 1.1A	
Varistor	MV-13	V21-0004-05	

Item	Name	Parts No.	Remarks
Vari-cap diode	1SV53A	V11-4161-36	
	1SV54GC	V11-4173-46	☆
LED	SLP-144	V11-6172-76	
	TLR-205	V11-3162-96	
Zener diode	WZ-061	V11-0243-05	
	WZ-090	V11-0240-05	
	WZ-110	V11-4161-46	
	XZ-055	V11-4105-50	
	XZ-060	V11-4101-20	
	XZ-090	V11-4167-06	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
	E22-0207-05	Lug plate	
	E22-0472-05	Lug plate Final	☆
	E23-0046-04	Square terminal Switch, Relay	
	E30-0181-05	AC cord UL/CSA K, M	
	E30-0185-05	AC cord SAA X	
	E30-0585-05	AC cord CEE W	
	E30-0602-05	AC cord 3P T	
	E31-2086-05	Coax cable with plug	
	E90-0004-15	Plate cap	
	F05-4022-05	Fuse 4A W, T, X, M	
	F05-6021-05	Fuse 6A K, M	
	F09-0041-05	Fan	
	G01-0801-04	Gnd spring	
	G09-0410-05	D spring φ6	
	G13-0633-14	Cushion Meter	
	G13-0639-04	Cushion Indicating tube	
	G53-0502-04	Packing Case side	
	G53-0512-04	Packing Panel	
	H01-2741-04	Carton case (inside) K, W, X, M	☆
	H01-2742-04	Carton case (inside) T	☆
	H03-1797-04	Carton case (outside)	☆
	H10-2539-02	Packing fixture (F)	
	H10-2540-02	Packing fixture (R)	
	H20-0439-03	Protective cover	
	H25-0120-04	Protective bag	
	J02-0022-05	Foot (small)	
	J02-0049-14	Foot (large)	
	J13-0033-15	Fuse holder	
	J25-3015-04	PC board Relay	☆
	J32-0029-04	Hex. boss Relay, PLL	
	J32-0159-04	Hex. boss Final	
	J41-0006-05	Cord bushing K, M	
	J41-0024-15	Cord bushing W, T, X	
	J42-0409-04	Knob bushing +0.5 SHIFT	
	J61-0019-05	Vinyle tie	
	J61-0401-05	Nylon band	
	J61-0402-05	Free up belt W	
	K01-0406-05	Handle	☆
	K21-0723-04	Pointer knob BAND	
	K23-0738-04	Knob 1 METER, AGC	
	K23-0745-04	Knob VOX, NB, CAR	☆
	K27-0414-04	Push knob	
	K29-0713-04	Push knob +0.5 SHIFT	
	K29-0715-04	Pointer knob MODE	
	K29-0737-04	Knob 5 PLATE	
	K29-0738-04	Knob 6	
	K29-0744-04	Paddle knob STBY	☆
L1	L40-6891-13	Choke coil 6.8μH	
L2	L33-0635-05	Final choke	
L3	L34-1004-05	Final coil B 28 MHz	
L4	L34-0560-25	Final coil A	
L5	L33-0259-05	Choke coil 470μH	
T1	L01-8106-15	Power trans	
PS1,2	L39-0046-05	PS coil PLATE	
	N09-0256-05	Gnd screw	

Ref. No.	Parts No.	Description	Remarks
	N14-0115-05	Flange nut GND	
	N14-0509-05	Wing nut GND	
	N14-0517-05	Cap nut BIAS	
	N30-4012-46	Round screw Foot (large)	
	N30-4016-46	Round screw GND	
	N30-4025-46	Round screw Foot (accessory)	
	N33-3006-41	Round flat screw SP	
	N35-3008-45	Bind screw Foot (small)	
	N35-4006-41	Bind screw Case	
	N87-4012-46	Self tapping screw Foot (large)	
	N89-3006-46	Bind tapping screw Final cover	
	N99-0306-04	Hex. head screw VFO	
R22	RC05GF2H221J	Solid 220Ω 1/2W	
R24	RC05GF3A103K	Solid 10kΩ 1W	
R25,26	RC05GF2H474J	Solid 470kΩ 1/2W	
R28	RC05GF2H330J	Solid 33Ω 1/2W	
VR1	R01-3414-05	Pot. 10kΩ(A) AF	☆
VR2	R01-3415-05	Pot. 10kΩ(B) RF	☆
VR3	R01-3417-05	Pot. 10kΩ(F) IF SHIFT	☆
VR4	R01-2405-05	Pot. 5kΩ(B) RIT/XIT	
VR5	R01-3414-05	Pot. 10kΩ(A) MIC	☆
VR6	R01-3416-05	Pot. 10kΩ(B) CAR	☆
VR7	R01-4408-05	Pot. 50kΩ(B) VOX GAIN	☆
VR8	R01-0404-05	Pot. 300Ω(B) NB	
VR9	R01-6401-05	Pot. 250kΩ(B) DELAY	
VR10	R01-0405-05	Pot. 300Ω(B) ANTI	☆
VR11,12	R01-3411-05	Pot. 10kΩ(B) RF OUT, BIAS	
S1~6	S40-2419-05	Push switch PC board type	
S7	S40-2403-05	Push switch +0.5 SHIFT	
S8,9	S36-1403-05	See saw switch HEATER, POWER	☆
S11	S01-1423-05	Rotary switch AGC	
S13	S01-1427-05	Rotary switch METER	☆
S14,16	S40-2415-05	Push switch Lead type	
S17	S33-2403-05	Paddle switch STBY	☆
S18	S01-2429-05	Rotary switch MODE	☆
S20	S31-2007-05	Slide switch SG	
S22	S01-3406-05	Rotary switch FINAL	
S23	S31-2027-05	Slide switch AC volt W,T,X,M	
RL1	S51-2407-05	Relay	
	T07-0215-05	Speaker	☆
	T40-0022-05	Motor FAN	
	X43-1370-02	Rectifier unit	☆
	X44-1360-01	RF unit	☆
	X48-1310-00	IF unit	☆
	X49-1150-00	AF unit	☆
	X50-1680-01	PLL unit	☆
	X54-1540-00	Counter unit	
	X56-1380-00	Final unit	
	X60-1150-01	VFO ass'y unit	☆

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
L44	L40-2282-01	Ferri-inductor 0.22μH	
L45,46	L40-1511-03	Ferri-inductor 150μH	
T1	L19-0303-05	Wide bandwidth trans	
T2	L30-0509-05	IFT	
T3	L19-0303-05	Wide bandwidth trans	
T4	L30-0509-05	IFT	
R34	RC05GF2H104J	Solid 100kΩ 1/2W	
R35	RC05GF2H151J	Solid 150Ω 1/2W	
R36	RC05GF2H104J	Solid 100kΩ 1/2W	
R37	RS14AB3A332J	Metal film 3.3kΩ 1W	
R38	RC05GF2H474J	Solid 470kΩ 1/2W	
VR2	R12-6404-05	Trim. pot 470kΩ	
	R92-0150-05	Short jumper	
	S29-7401-05	Rotary wafer ass'y	

IF UNIT (X48-1310-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0457-05	C 0.022μF	
C5,6	CC45SL1H470J	C 47pF	
C7	CE04W1C100M	E 10μF 16V	
C9~15	C91-0457-05	C 0.022μF	
C18	C91-0456-05	C 0.047μF	
C19	C91-0457-05	C 0.022μF	
C20	CC45SL1H100D	C 10pF ±0.5pF	
C23	C91-0457-05	C 0.022μF	
C24	CC45SL1H100D	C 10pF ±0.5pF	
C25	C91-0457-05	C 0.022μF	
C26	C91-0456-05	C 0.047μF	
C27	CC45SL1H470J	C 47pF	
C28	C91-0456-05	C 0.047μF	
C29	C91-0457-05	C 0.022μF	
C30	C91-0456-05	C 0.047μF	
C31	CC45SL1H100D	C 10pF ±0.5pF	
C32	CC45UJ1H070D	C 7pF ±0.5pF	
C35	CQ92M1H333K	ML 0.033μF	
C36	C91-0456-05	C 0.047μF	
C37	CC45SL1H470J	C 47pF	
C38	C91-0457-05	C 0.022μF	
C40	C91-0456-05	C 0.047μF	
C44,47	CC45SL1H470J	C 47pF	
C49,50	CC45SL1H101J	C 100pF	
C51	CE04W1H010M	E 1μF 50V	
C52	CE04W1C100M	E 10μF 16V	
C53	CQ92M1H153K	ML 0.015μF	
C54,56~58	CE04W1H010M	E 1μF 50V	
C59	CE04W1H3R3M	E 3.3μF 50V	
C60,61,63	CE04W1H010M	E 1μF 50V	
C64	CE04W1H4R7M	E 4.7μF 50V	
C65	CE04W1C100M	E 10μF 16V	
C66	CE04W1H4R7M	E 4.7μF 50V	
C67	CE04W1A221M	E 220μF 10V	
C68	CQ92M1H473K	ML 0.047μF	
C69	CE04W1A470M	E 47μF 10V	
C70	CE04W1C100M	E 10μF 16V	
C71	CE04W1H010M	E 1μF 50V	
C72	CE04W1H3R3M	E 3.3μF 50V	
C73	CE04W1H010M	E 1μF 50V	
C74	C91-0457-05	C 0.022μF	
C75	CE04W1A221M	E 220μF 10V	
C76	CC45UJ1H100D	C 10pF ±0.5pF	
C77	CC45SL1H101J	C 100pF	
C78	C91-0457-05	C 0.022μF	
C79	CC45CH1H050C	C 5pF ±0.25pF	
C80	CE04W1C220M	E 22μF 16V	
C84	CE04W1H010M	E 1μF 50V	
C85	C91-0456-05	C 0.047μF	
C86~89	CE04W2V220	E 22μF 350V	
C91,92	CC45SL1H470J	C 47pF	
C93,94	CE04W1C100M	E 10μF 16V	
TC1,2	C05-0030-15	Ceramic trimmer 20pF	
	E23-0401-05	Round terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0573-05	Mini connect wafer 5P	
	E40-0773-05	Mini connect wafer 7P	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-1511-03	Ferri-inductor 150μH	
L2	L34-0940-05	Tuning coil	
L3,4	L40-1511-03	Ferri-inductor 150μH	
L5	L34-0942-05	Tuning coil	
L6	L34-0997-05	Tuning coil	
L7,8	L34-0535-05	Tuning coil	
L9	L40-1511-03	Ferri-inductor 150μH	
L10	L34-0536-05	Tuning coil	
L11,12	L40-1511-03	Ferri-inductor 150μH	
L13	L34-0567-05	Tuning coil BM	
L14	L40-4711-03	Ferri-inductor 470μH	
L15	L40-1511-03	Ferri-inductor 150μH	
CF1	L72-0324-05	Ceramic filter 8.83MHz NB	☆
XF1	L71-0208-05	MCF YK-88S	
R111	RS14GB3D471J	Metal film 470Ω 2W	
VR1	R12-3045-05	Trim. pot 10kΩ	
VR2	R12-6401-05	Trim. pot 470kΩ	
VR3	R12-5030-05	Trim. pot 100kΩ	
VR4	R12-0401-05	Trim. pot 100Ω	
VR5	R12-3045-05	Trim. pot 10kΩ	
	R92-0150-05	Short jumper	
RL1	S51-4401-05	Relay LZN-4	

AF UNIT (X49-1150-00)

Ref. No.	Parts No.	Description	Re-marks
C1,2	CQ92M1H123K	ML 0.012μF	
C3	CQ92M1H223K	ML 0.022μF	
C4,5	CQ92M1H123K	ML 0.012μF	
C6	CE04W1C100M	E 10μF 16V	
C7	CE04W1H010M	E 1μF 50V	
C8	CE04W1HR10M	E 0.1μF 50V	
C9	CE04W1C100M	E 10μF 16V	
C10	CQ92M1H103K	ML 0.01μF	
C11	CE04W1A101M	E 100μF 10V	
C12	CE04W1HR47M	E 0.47μF 50V	

PARTS LIST

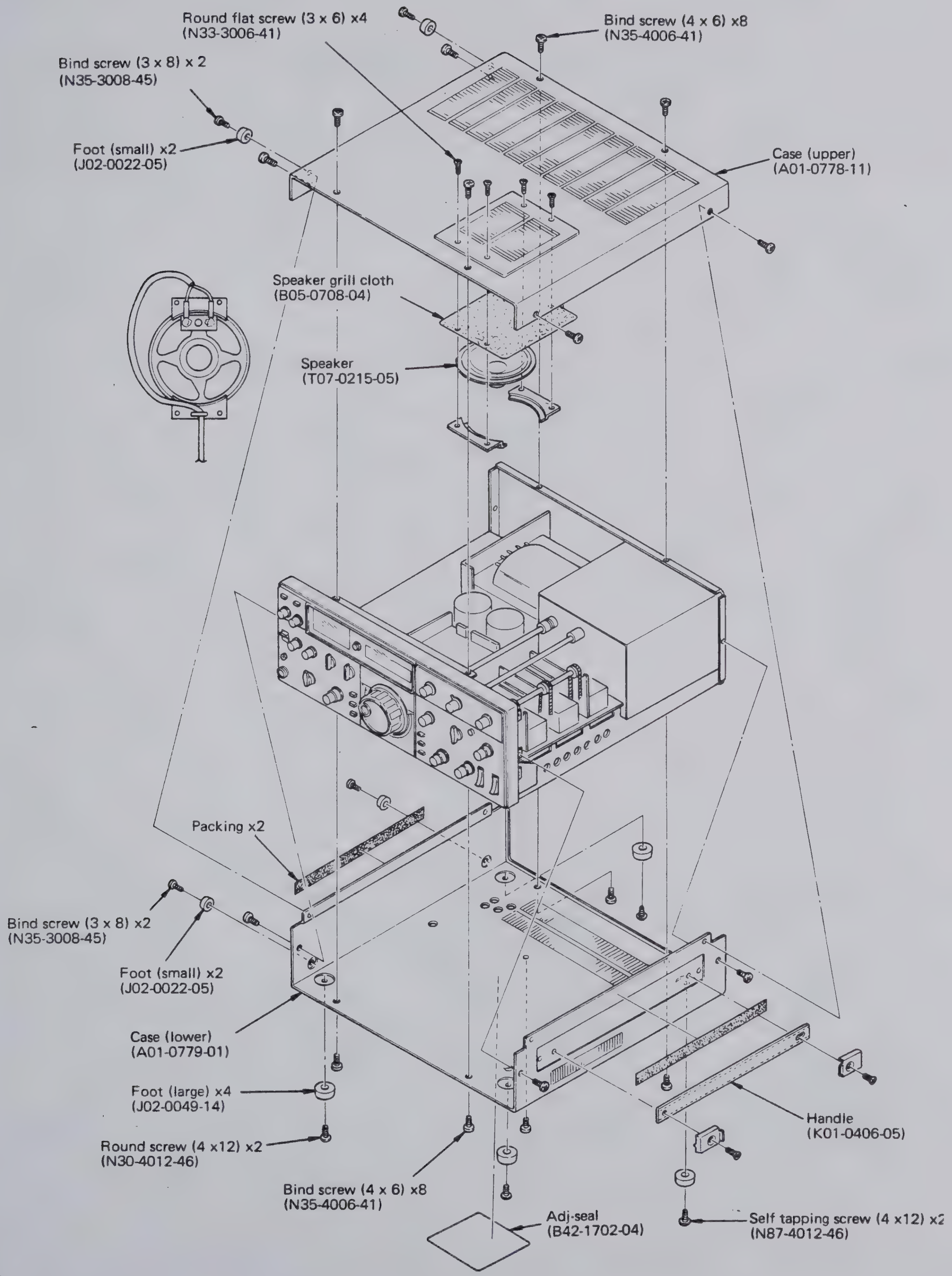
Ref. No.	Parts No.	Description	Re-marks
C113	CC45SL1H101J	C 100pF	
C115	CC45RH1H100D	C 10pF ±0.5pF	
C116	CC45TH1H050C	C 5pF ±0.25pF	
C117	CC45CH1H010C	C 1pF ±0.25pF	
C118	CC45RH1H560J	C 56pF	
C120	CC45CH1H020C	C 2pF ±0.25pF	
C121	CC45SL1H470J	C 47pF	
C123	CC45RH1H390J	C 39pF	
C125	CC45TH1H330J	C 33pF	
C126	CC45TH1H150J	C 15pF	
C127	CC45TH1H330J	C 33pF	
C130	CC45UJ1H150J	C 15pF	
C131	CC45UJ1H050C	C 5pF ±0.25pF	
C132	CC45UJ1H150J	C 15pF	
C139	CC45SL1H100D	C 10pF ±0.5pF	
C140	CC45RH1H220J	C 22pF	
C142	CC45RH1H470J	C 47pF	
C143	CC45RH1H220J	C 22pF	
C144	CC45RH1H470J	C 47pF	
C159	CC45SL1H330J	C 33pF	
C160	CC45SL1H100D	C 10pF ±0.5pF	
C162	CC45CH1H010C	C 1pF ±0.25pF	
C163	CC45SL1H150J	C 15pF	
C166	CC45SL1H100D	C 10pF ±0.5pF	
C167	CC45CH1H020C	C 2pF ±0.25pF	
C169	CC45SL1H101J	C 100pF	
C172	C91-0456-05	C 0.047µF	
C173	CC45CH1H010C	C 1pF ±0.25pF	
C174	CC45UJ1H680J	C 68pF	
C178,179	CC45SL1H220J	C 22pF	
C182,183	C91-0456-05	C 0.047µF	
C184	CC45CH1H270J	C 27pF	
C185	CC45CH1H390J	C 39pF	
C186	CC45CH1H101J	C 100pF	
C187	CC45SL1H221J	C 220pF	
C188	CC45SL1H220J	C 22pF	
C189	CC45SL1H050C	C 5pF ±0.25pF	
C194	CE04W1A470M	E 47µF 10V	
C196	CC45SL1H100D	C 10pF ±0.5pF	
C197~202	C91-0456-05	C 0.047µF	
C205	CE04W1HR47M	E 0.47µF 50V	
TC1	C05-0029-15	Ceramic trimmer 50pF	
TC2,3	C05-0056-05	Ceramic trimmer 30pF	
	E04-0154-05	Coax connector	
	E23-0046-04	Square terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0673-05	Mini connect wafer 6P	
	E40-0973-05	Mini connect wafer 9P	
	E40-1073-05	Mini connect wafer 10P	
L1~7	L40-1511-03	Ferri-inductor 150µH	
L8	L40-4701-03	Ferri-inductor 47µH	
L9	L40-1592-02	Ferri-inductor 1.5µH	
L10	L40-1092-02	Ferri-inductor 1µH	
L11	L40-1292-02	Ferri-inductor 1.2µH	
L12	L40-1892-02	Ferri-inductor 1.8µH	
L13,14	L40-4711-03	Ferri-inductor 470µH	
L15,16	L40-8201-03	Ferri-inductor 82µH	
L17	L40-1511-03	Ferri-inductor 150µH	
L18~20	L40-2701-03	Ferri-inductor 27µH	
L21~24,27~30	L40-1511-03	Ferri-inductor 150µH	

Ref. No.	Parts No.	Description	Re-marks
L31	L40-2211-03	Ferri-inductor 220µH	
L32	L33-0636-05	Choke coil 20µH	
L33~36	L40-1511-03	Ferri-inductor 150µH	
L37	L40-4711-03	Ferri-inductor 470µH	
L38,39	L40-1511-03	Ferri-inductor 150µH	
L40	L40-4711-03	Ferri-inductor 470µH	
L41,42	L40-4701-03	Ferri-inductor 47µH	
L43,44	L40-2211-03	Ferri-inductor 220µH	
L45~49	L40-1511-03	Ferri-inductor 150µH	
T1	L32-0195-05	OSC coil 7, 10 MHz	
T2	L32-0193-05	OSC coil 1.5, 3.5 MHz	
T3	L32-0196-05	OSC coil 14 MHz	
T4	L32-0199-05	OSC coil 18 MHz	
T5	L32-0198-05	OSC coil 28 MHz	
T6	L32-0197-05	OSC coil 21, 24.5 MHz	
T7	L34-0714-05	Tuning coil	
T8	L34-0715-05	Tuning coil	
T9	L34-0716-05	Tuning coil	
T10	L34-0717-05	Tuning coil	
T11	L34-0718-05	Tuning coil	
T12	L34-0757-05	Tuning coil	
T13	L34-0711-05	Tuning coil	
T14	L34-0713-15	Tuning coil	
T15	L34-0712-05	Tuning coil	
T16	L32-0201-05	OSC coil 8.83 MHz	
T17	L34-0709-05	Tuning coil 10 MHz	
T18	L34-0710-05	Tuning coil 20 MHz	
X1	L77-0482-05	Crystal 10 MHz	
X2	L77-0486-05	Crystal 8.8285 MHz	
X3	L77-0485-05	Crystal 8.8315 MHz	
VR1	R12-5030-05	Trim. pot 100kΩ	
VR2,3	R12-1040-05	Trim. pot 4.7kΩ	
	R92-0150-05	Short jumper	

COUNTER UNIT (X54-1540-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0456-05	C 0.047µF	
C3	C91-0457-05	C 0.022µF	
C4	CC45SL1H150J	C 15pF	
C6	CE04W1A470Q	E 47µF 10V	
C7	CE04W1A101Q	E 100µF 10V	
C8,9	C91-0456-05	C 0.047µF	
C11	CE04W1C101M	E 100µF 16V	
C12	CE04W1V100Q	E 10µF 35V	
C13	CQ92M1H103K	ML 0.01µF 50V	
C14~16	CE04W1V100Q	E 10µF 35V	
C17,18	C91-0456-05	C 0.047µF	
C19	CQ92M1H103K	ML 0.01µF 50V	
C21,22	CC45SL1H050C	C 5pF ±0.25pF	
C23	CE04W1A330Q	E 33µF 10V	
C24~26	C91-0456-05	C 0.047µF	
C28	CE04W1H100M	E 10µF 50V	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-4711-03	Ferri-inductor 470µH	
L2	L40-1011-04	Ferri-inductor 100µH	
L3	L40-2211-03	Ferri-inductor 220µH	
L4	L40-1511-03	Ferri-inductor 150µH	

DISASSEMBLY



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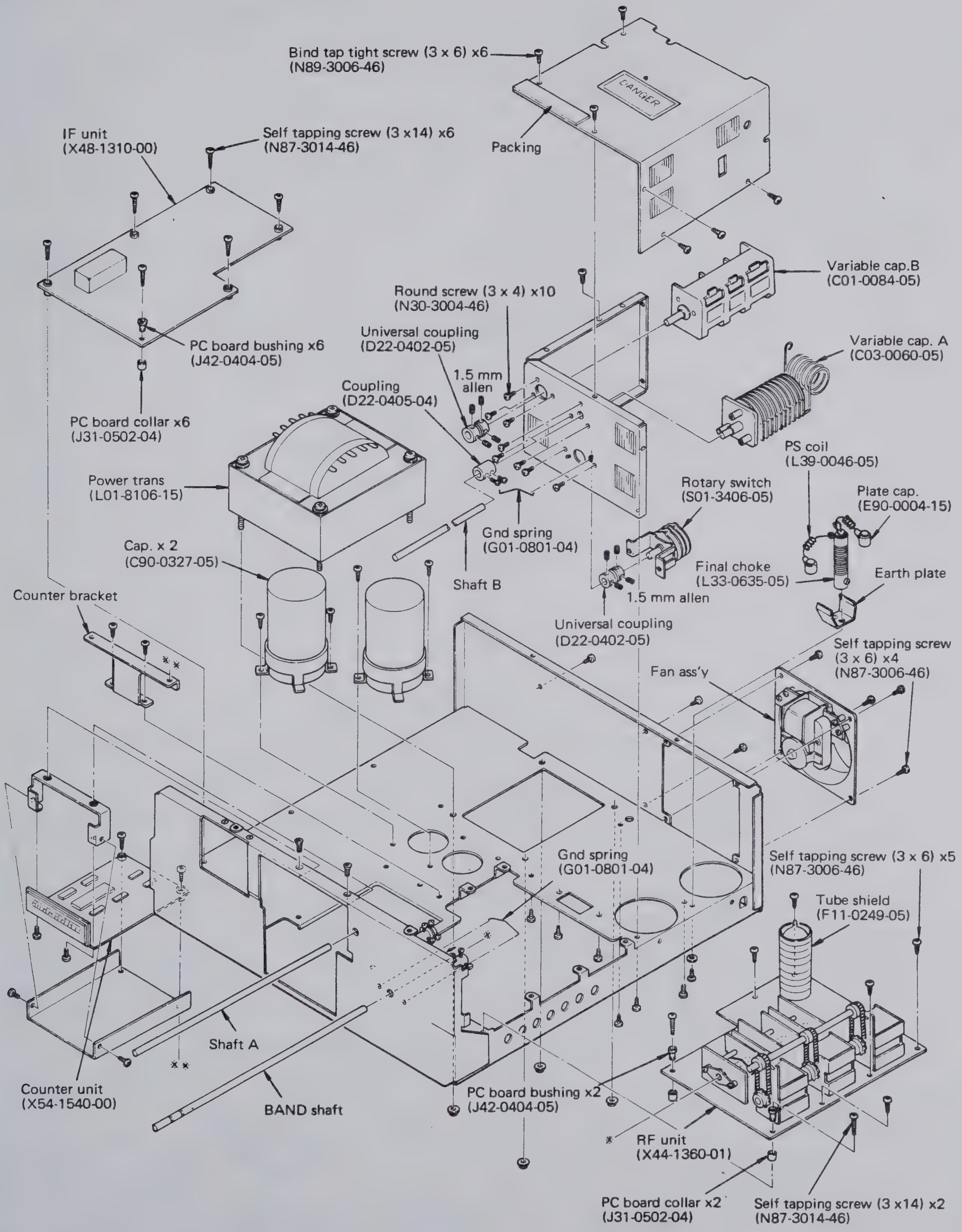

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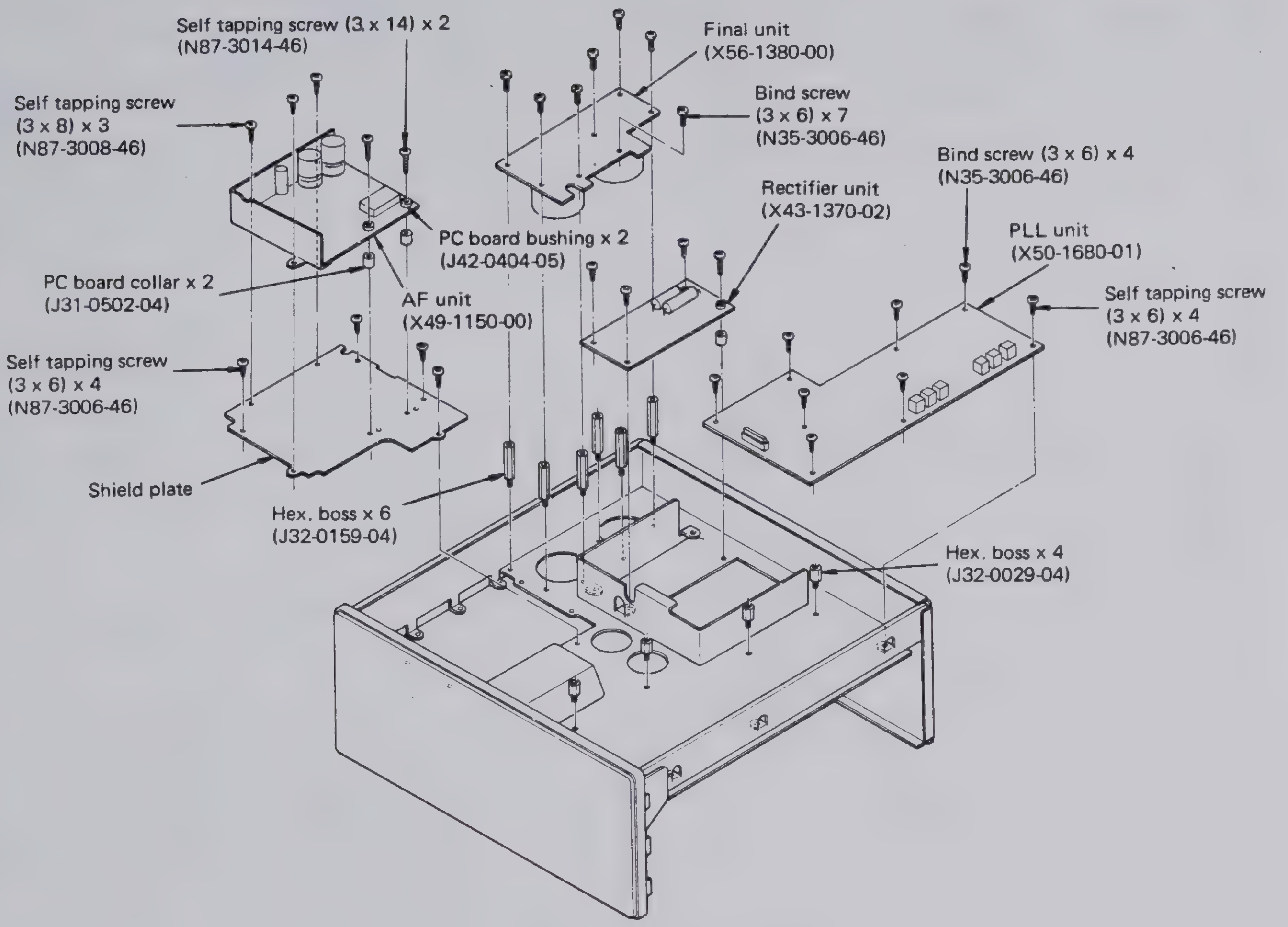
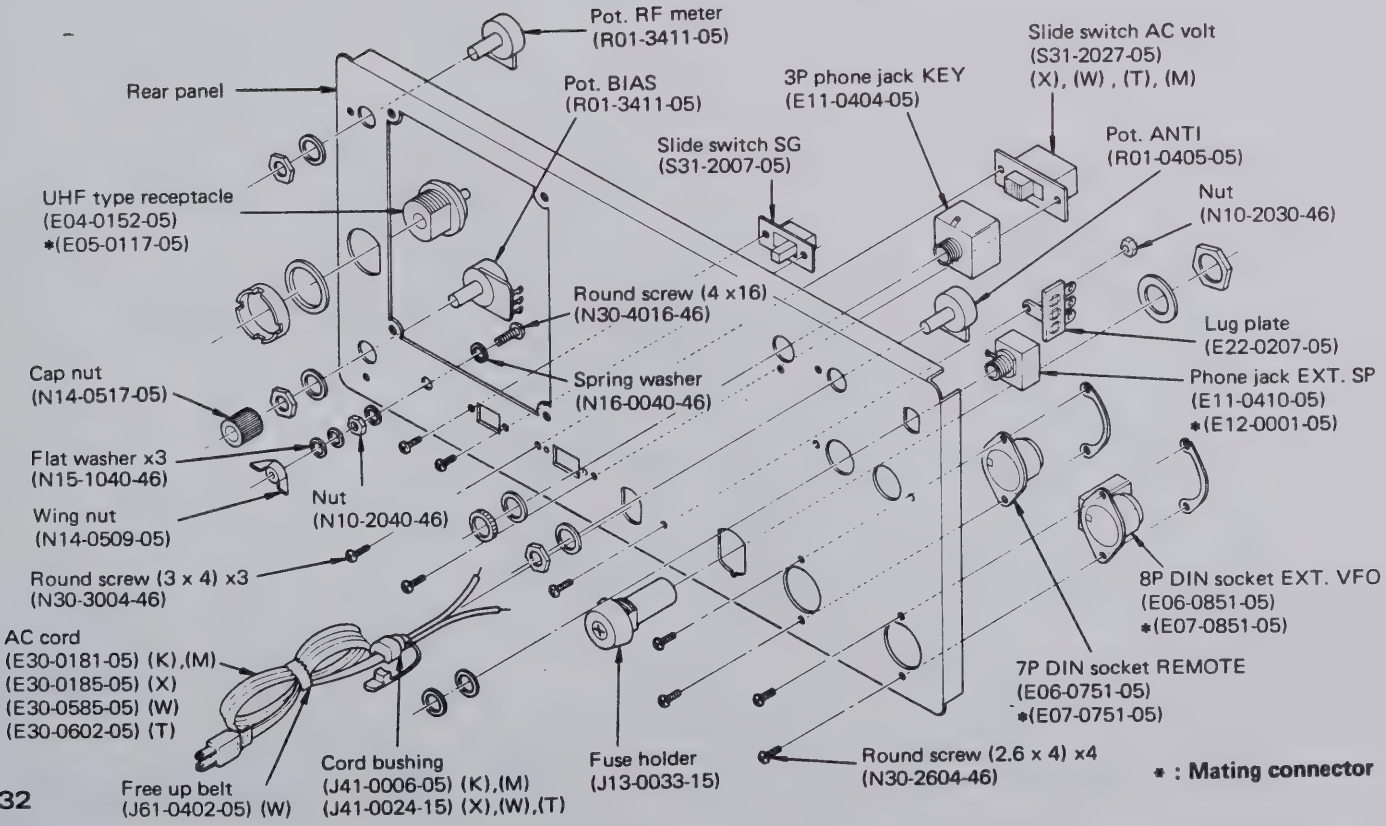




*** : Mating connector**

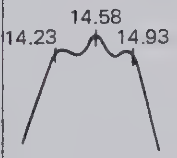
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. 9V AVR and 3.2V adjustment		DVM	AF	TP-6 Pin-5, connector ⑪	AF	VR2 VR3	9V 3.2V	9V±0.05V 3.2V±0.05V	RF1 (FET bias)
2. Base current adjustment	SG SW : ON MODE: USB METER : IP HEATER : ON DRIVE : Fully clockwise STBY : SEND BIAS pot. : Adjust	1P meter			Rear panel	Bias pot.		Set to 60mA	
	STBY REC, SG SW OFF								
3. Carrier adjustment①	IF SHIFT : Centered MODE : USB	RF VTVM	IF	Pin1, connector ⑧	PLL	NOTE : T16	0.3V	0.3V±1 dB	NOTE : The slug of T16 should be turned counter clockwise for this adjustment after the peak point is determined.
	MODE : LSB STBY : REC ↕ SEND	F. counter				VR2	Obtain the same frequency for both transmission and reception	±20 Hz	
	STBY : REC					TC2	8828.50 kHz		
	MODE : USB					TC3	8831.50 kHz		
	MODE : CW STBY : SEND					VR3	8830.70 kHz		
	STBY : REC								
4. IF SHIFT check	MODE : LSB Rotate the IF SHIFT and check the variation	F. counter	IF	Pin 1, connector ⑧				Set IF SHIFT to center. More than + 1.1 kHz , Less than −1.1 kHz.	
	MODE : USB Same as above								
	STBY : SEND Regardless of the IF SHIFT setting							8831.50 kHz	USB
								8828.50 kHz	LSB
	STBY : REC								
5. VFO, RIT check and adjustment	Scale 0~500							Should rotate smoothly and have no abnormal noise.	
	Rear panel SG SW OFF VFO : 250	RF VTVM	PLL	Pin 1, connector ⑥ 2P(GND)	Adjust if the voltage is out of specification. VFO	TC2	200mV	200 mV±1 dB	
	MODE : CW STBY : SEND	F. counter	Rear panel	EXT VFO 1P, 7P (GND)		Adjust if the frequency is out of specification.	800 Hz UP	800±50 Hz	CW SHIFT

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	RIT OFF								
6. Reference oscillator adjustment		F. counter	PLL	TP2	PLL	TC1	1000.000 kHz		
7. VCO adjustment and check	Check the frequencies at the following points and adjust coils until those given in brackets are obtained.	F. counter DVM	PLL PLL	D40 TP1					

VFO / BAND	0	250	500	Adjusting point	
				Unit	Part
1.5	10.33 MHz	10.58 MHz (4.0V)	10.83 MHz	PLL	T2
3.5	12.33	12.58	12.83		
7	15.83	16.08 (4.75V)	16.33		T1
10	18.83	19.08	19.33		
14	22.83	23.08 (4.5V)	23.33		T3
18	26.83	27.08 (5.0V)	27.33		T4
21	29.83	30.08 (3.5V)	30.33		T6
24.5	33.33	33.58	33.83		
28	36.83	37.08	37.33		T5
28.5	37.33	37.58	37.83 (4.75V)		
29	37.83	38.08	38.33		
29.5	38.33	38.58	38.83		

Item	Condition	Test equipment	Unit	Terminal	Unit	Parts	Method	Specification	Remarks
	Check the level at each of the above points.	RF VTVM	RF	TP3				1V $^{+3}_{-2}$ dB	
PLL lock range	Both edges of the VFO frequency in each band.							Display should indicate.	
8. BPF-A	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D24 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the sweep generator RF output to the EXT-VFO connector.	Sweep generator Oscilloscope	PLL	Q35 Ⓔ	PLL	T13 T14 T15	Adjust until the response shown to the right is obtained.		

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
13. Coil pack adjustment	Connect the SSG (40dB) to the ANT terminal DRIVE : 12:00 While adjusting, gradually decrease the SSG output level down to –6 dB. Adjust at the following points:	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil RF coil	Max. audio output		

No.	BAND	VFO	f	Parts
1	1.5	400	1.9 MHz	1.8
2	3.5	250	3.75	3.5
3	7	150	7.15	7
4	10	125	10.125	10
5	14	175	14.175	14
6	18	125	18.125	18
7	21	225	21.225	21
8	24.5	450	24.950	24.5
9	28.5	300	28.800	28

Item	Condition	Test equipment	Unit	Terminal	Unit	Parts	Method	Specification	Remarks
14. Drive coil adjustment	CAL : ON CAR VR : optinum level METER : ALC HEATER : ON MODE : CW SG SW : OFF ANT : 50Ω dummy should be connected. Connect pin 2 to pin 4, connector ⑦ on the AF unit with a clip lead. Receive the marker frequency in the following bands and obtain the peak level by adjusting the DRIVE control. Set the STBY switch to SEND and adjust each drive coil.	50Ω dummy			RF	DRIVE coil	Max. ALC meter reading		NOTE: The 50Ω dummy should be connected to the ANT terminal. Otherwise drive tuming will be incorrect.

BAND	VFO	Parts
1.5	400	1.8
3.5	250	3.5
7	150	7
(10)	(125)	10
14	175	14
(18)	(125)	18
21	225	21
(24.5)	(450)	24.5
28.5	300	28

STBY : REC

(   ) : See note **BEFORE** adjustment

Note :

TRANSMITTING ON WARC BANDS

As supplied, the TS-530S will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required.

1. For all 3 bands : Break the line between the RF unit X44-1360-01, connector #6, Pin #1 (TOF terminal) and AF unit X49-1150-00, connector #7, Pin #4 (TOF terminal).
2. Or, for individual Bands : On the RF unit X44-1360-01 :

Band	Remove (or Cut) Part
10 MHz	D4
18 MHz	D5
24.5 MHz	D6

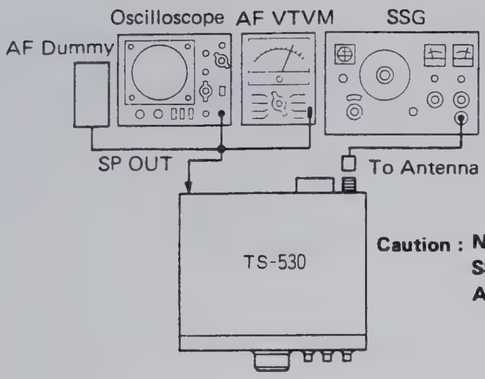
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
NB adjustment	AGC : FAST Disconnect the SSG output from the ANT terminal, and connect the noise generator output in it's place. Set the noise generator output level to S5~7.	Speaker	Rear panel	EXT. SP					
	NB : ON							The NB must provide adequate effect.	
					If adequate effect is not obtained, repeat the adjustment several times.				
	Reduce the noise generator output level to below the threshold of sensitivity. Turn the NB LEVEL control fully clockwise.							Noise must be blanked.	
	NB : OFF								
19. Neutralization trimmer adjustment	BAND : 28, +0.5 SHIFT : ON VFO :300 SG SW : ON STBY : SEND Tune the DRIVE, PLATE and LOAD	Power meter Sync'ed scope	Rear panel	ANT					Tune-up for MAX RF output.
	SG SW : OFF							RF output must be 0.	
	METER : ALC Set the ALC to maximum with the DRIVE control. Increase oscilloscope sensitivity.					Neutralization trimmer TC1	Minimum		
	Reduce oscilloscope sensitivity (5V/div.). SG SW : ON							The normal power must be obtained. The signal waveform must be normal.	
20. Side tone, semi-break-in function adjustment	Connect a power meter to the ANT terminal. Plug key into the rear Key jack to transmit in any band.	Oscilloscope AF VTVM	Rear panel	EXT. SP	AF	VR1	0.63V/8Ω		
	Operate the key.							The key must control RF output.	
	STBY : REC VOX : ON Operate the key							Semi-break- in operation should be available.	

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	AG : 300Hz ↕ 2700Hz				PLL	TC3	Adjust until the same level is obtained for both 300Hz and 2700Hz (equal audio rolloff).		
	MODE : LSB same as above					TC2			
	AG : 400Hz AG : 2600Hz							More than 1/2 with respect to the 1500Hz signal level observed on the scope.	
	After completing the above adjustment, readjust carrier suppression (see item 23.)				IF	VR4 TC1	Minimum	Less than –50dB	
	STBY : REC								
25. Speech processor adjustment	SG SW : OFF MODE : USB PROC : OFF METER : ALC Connect the AG (1500 Hz, 10mV) to the MIC input connector. STBY : SEND Adjust the MIC gain control until the meter indicates the maximum on-scale ALC reading.								
	PROC : ON				IF	VR3	Adjust until the same meter reading is obtained (max on-scale ALC).		
	STBY :REC PROC : OFF								

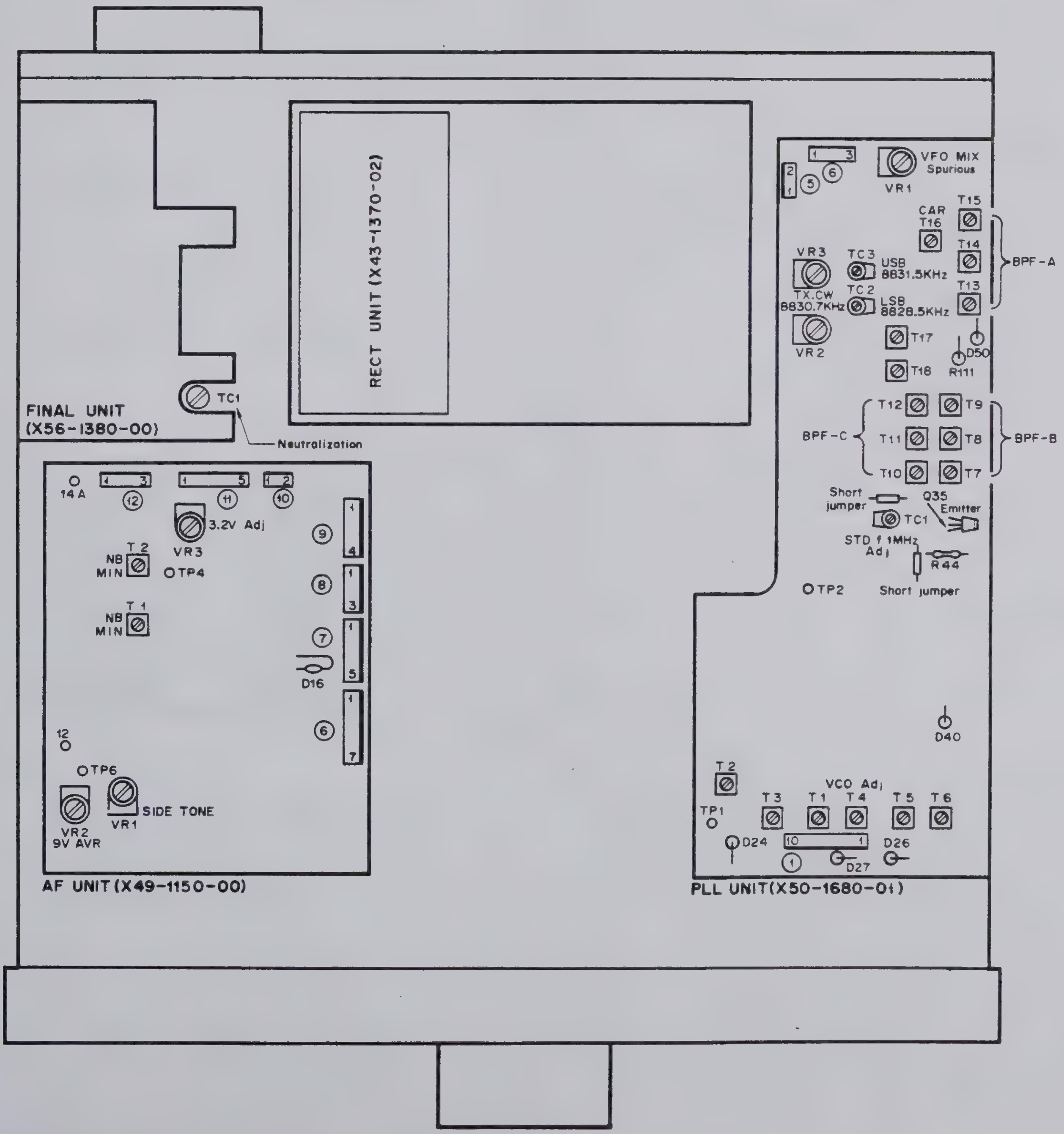
ADJUSTMENTS



Caution : Never transmit when SSG is connected to the ANT terminal.

Fig. 12 (12) IF AMP, (13) COIL PACK, (15) IF TRAP

▼ **BOTTOM VIEW**



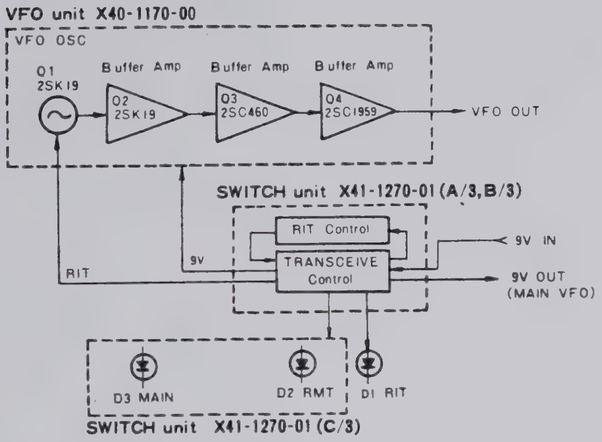
VFO-240

SPECIFICATIONS

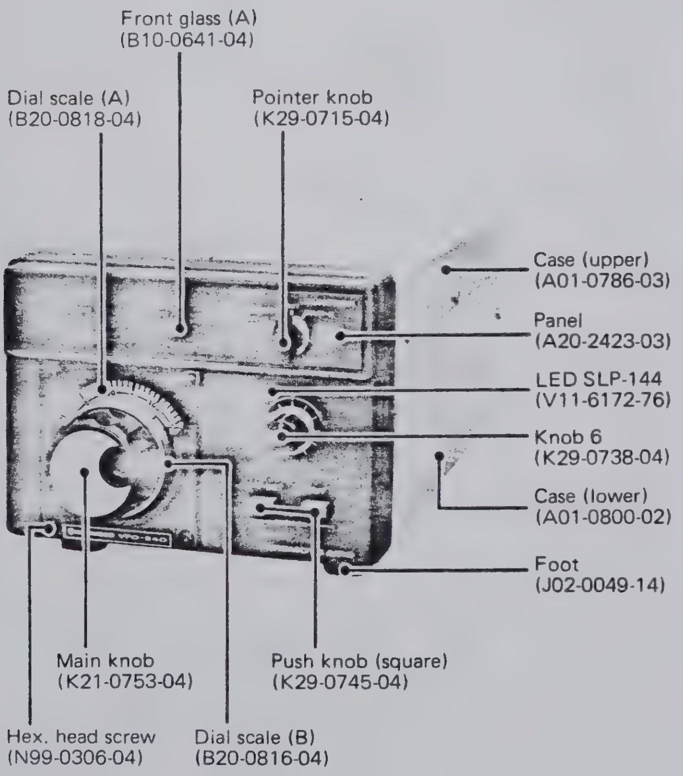
Oscillator frequency	5.50～6.00 MHz
Oscillator circuit	Clapp
Output voltage	0.2V ±1dB (across 470 ohm load)
Frequency stability	Within 100 Hz per 30 minutes after 3 minutes warm-up (at room temperature)
Solid-state complement	FET: 2 Transistor: 2 Diode: 6
Power source	From TS-530S or TS-830S
Dimensions	180 (7-1/8") W × 133 (5-1/4") H × 288 (11-5/16") D mm (inch)
Weight	2.9 kg (6.4 lbs)

* Specifications are subject to change for improvement without notice.

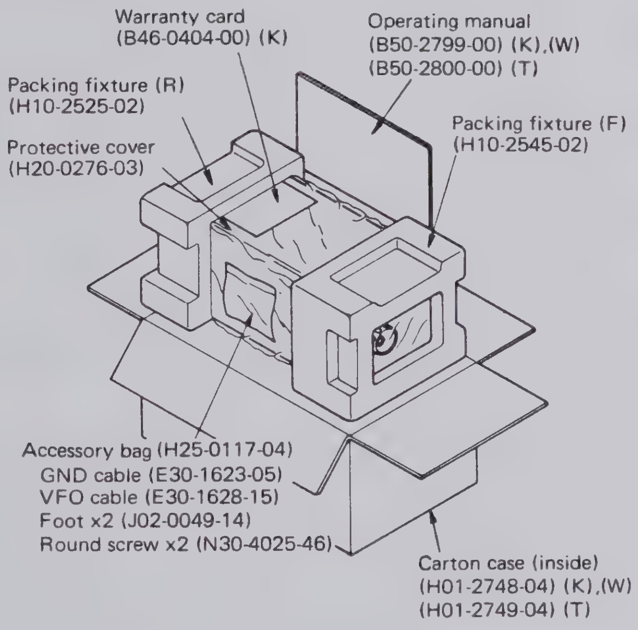
BLOCK DIAGRAM



OUTSIDE VIEW



PACKING



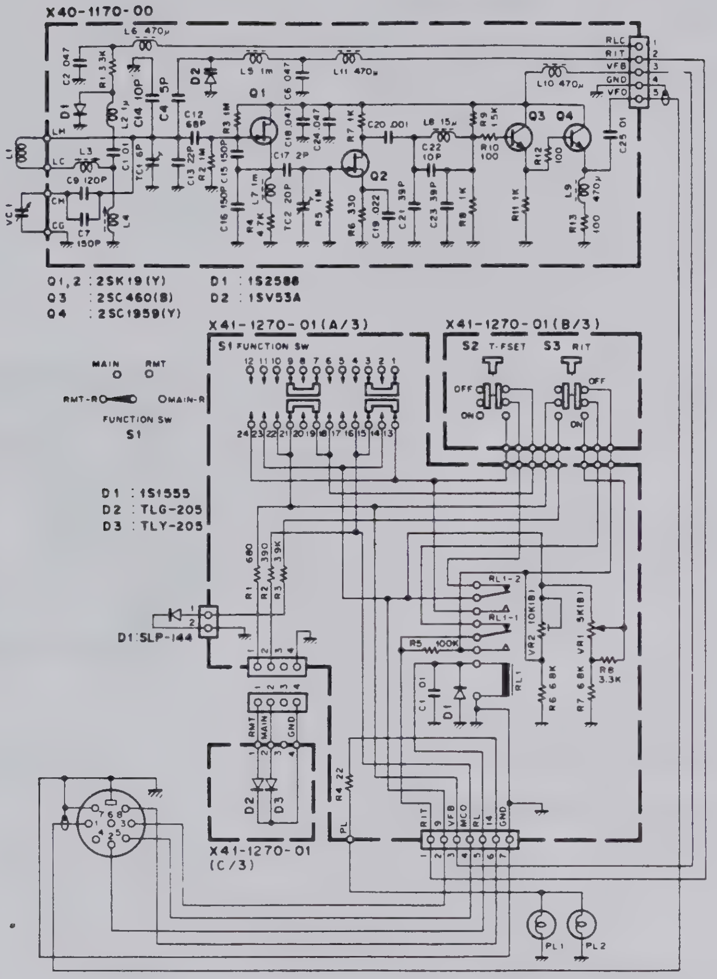
PARTS LIST

☆: New parts

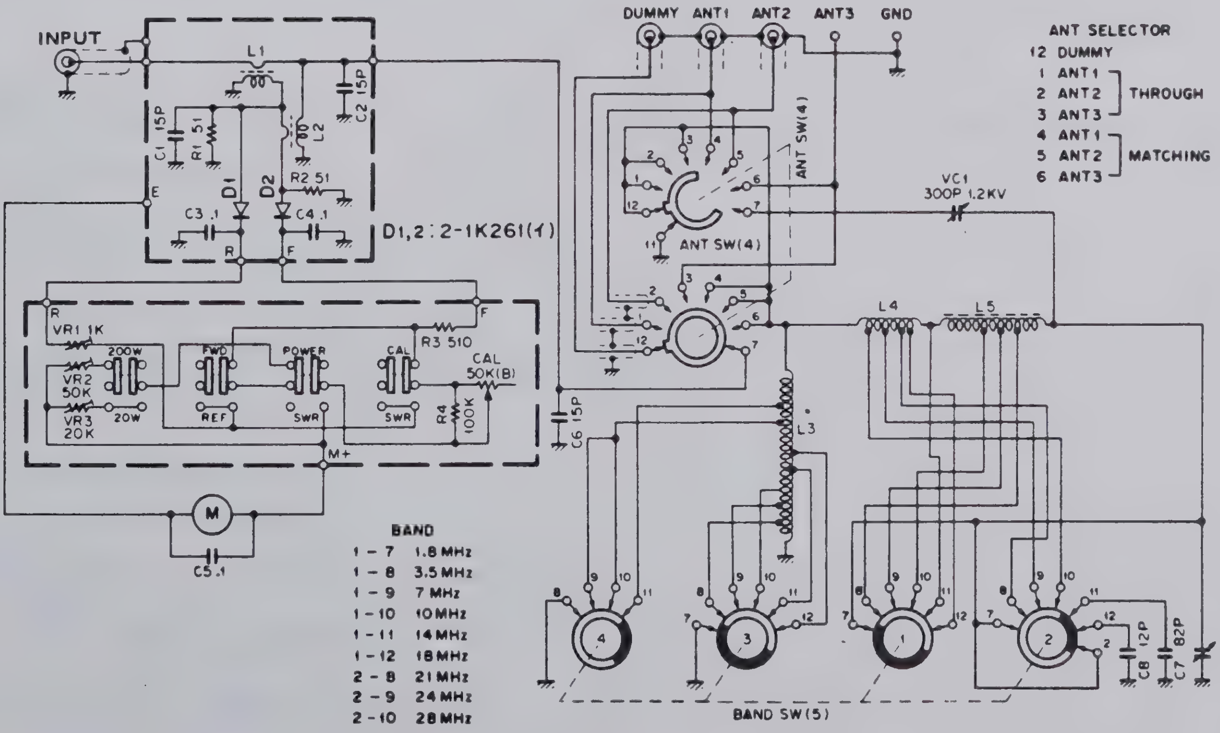
Ref. No.	Parts No.	Description	Re-marks
		VFO-240 GENERAL	
	A01-0786-03	Case (upper)	
	A01-0800-02	Case (lower)	☆
	A20-2423-03	Panel	☆
	B10-0641-04	Front glass (A)	☆
	B43-0658-04	Name plate T	☆
	B43-0659-04	Name plate K,W	☆
	B46-0404-00	Warranty card K	
	B50-2799-00	Operating manual K,W	☆
	B50-2800-00	Operating manual T	☆

VFO-240/AT-230

VFO-240
SCHEMATIC DIAGRAM

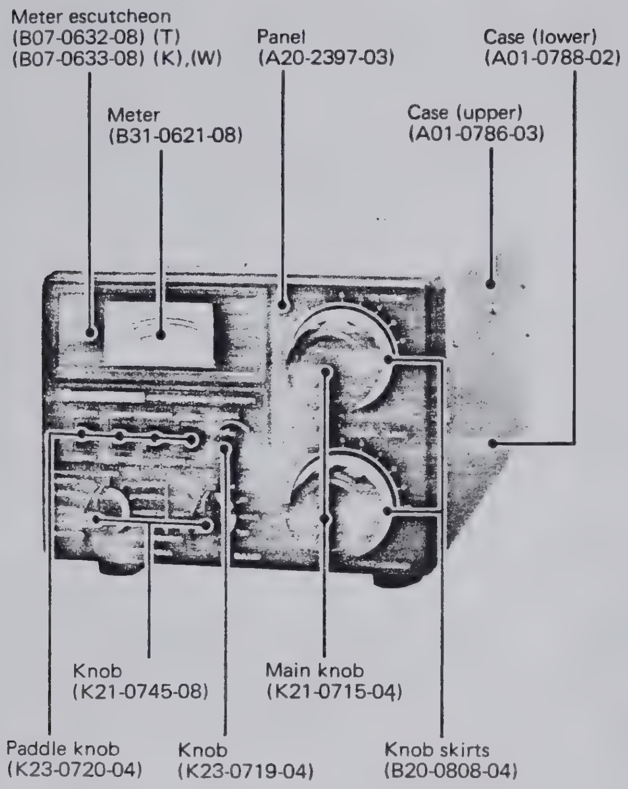


AT-230
SCHEMATIC DIAGRAM



AT-230

OUTSIDE VIEW



ADJUSTMENTS

1. INSTRUMENTS

1) Terminated Power Meter

1. Frequency range: 50 MHz or more
2. Input impedance: 50Ω
3. Power range: 20W and 200W

2) HF Transmitter or Transceiver

1) Output: 100W CW
Variable to 10W.
Example: TS-530, TS-830S

2. POWER METER ADJUSTMENT

1) Test Equipment Connection

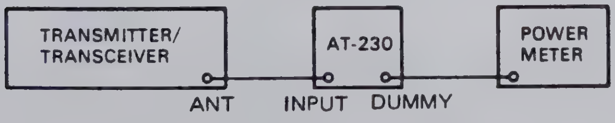


Fig. 1

2) Adjustment

1. Connect as in Fig. 1.
2. Unless otherwise specified, controls should be set as follows:

ANT SW	DUMMY
BAND SW	14
200W/20W SW	200W
FWD/REF SW	FWD
POWER/SWR SW	POWER
CAL/SWR SW	SWR

Tune up the transceiver at 14.175 MHz

3. Adjust the transceiver for 100W output at the power meter (adjusted by the carrier level control)
Adjust VR2 on the switch unit for a meter reading of 100 on the AT-230.

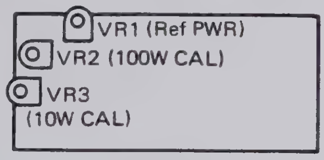


Fig. 2

4. As in step 3, lower transceiver output to 10W and adjust VR3 for a meter indication of 10 on the 20W scale

3. CALIBRATION OF REF POWER

1) Connection

As in Fig. 1

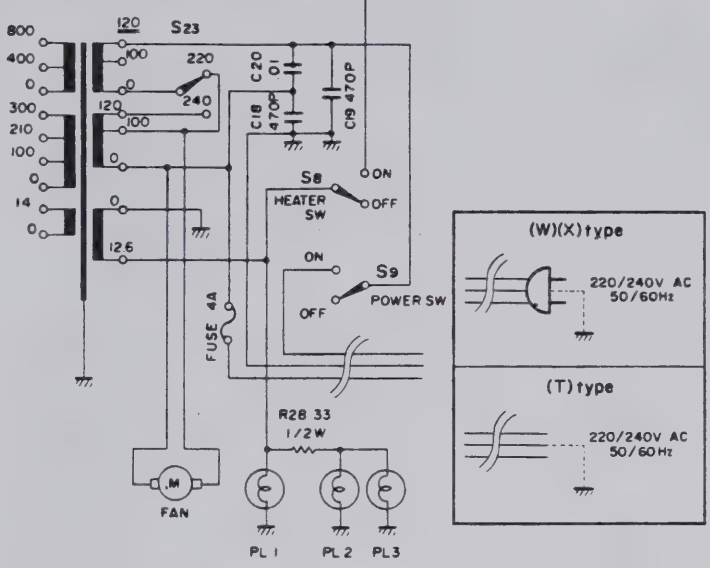
2) Adjustment

1. Set controls as described in 2.2.
Confirm 100W CW output reading
2. Unkey the transceiver and reverse the coaxial cable between the INPUT and DUMMY terminals on the AT-230. Move the FWD/REF switch to the REF position
3. Transmit and adjust VR1 for previously confirmed 100W reading

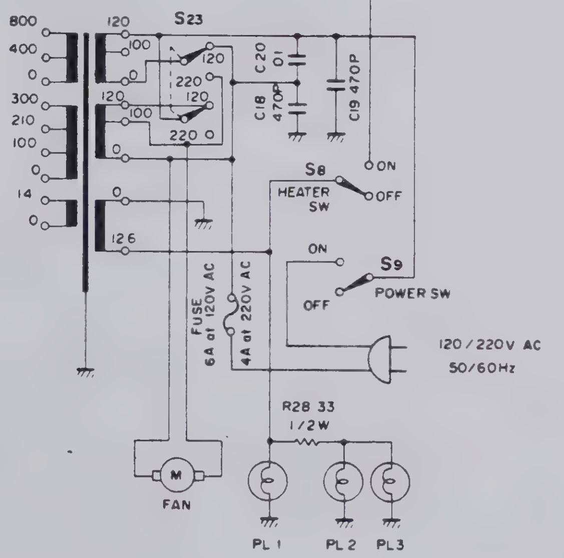
SCHEMATIC ABBREVIATION

Connector No.	Terminal name	
⑧	RLT	+ 9V on transmit
	RLR	+ 9V on receive
	−6	B −6V
⑨	ALC	ALC output from Q31
	RLT	+ 9V when transmit
	RLR	+ 9V when receive
	RL	Relay voltage
⑩	RAL	External ALC input remote socket
	VR2	Arm of TX bias control
⑪	NBV	Top of noise blanker VR
	NBS	Noise blanker SW
	9	B + 9V
	PRS	Processor SW
	RF1	Top of RF gain control
⑫	NSG	Noise blanker gate signal
	RB2	Receiver bias for IF unit
	14A	14V input
	G14	14V input (ground)
	FG	Bias for control grid of 6146B
Final unit (X56-1380-00)		
	DRV	Drive input
	FG	Control grid bias
	H	Heater voltage AC12.3V
	IPM	IP meter voltage
	SG	Screen grid voltage
Rectifier unit (X43-1370-02)		
	800	B + 800V
	HV	High voltage signal to METER
	300B	B + 300V
	210B	B + 210V
	210A	B + 210V
	−C	Common B− approx. −100V
	12	Screen grid cut off voltage
	SG2	Screen grid voltage
	TUN	Screen grid voltege for TUN

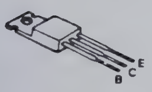
TS-530S (T)(W)(X)Type



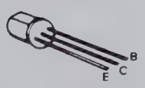
TS-530S (M)Type



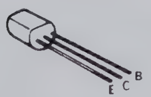
2SA473



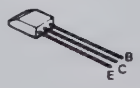
2SA562



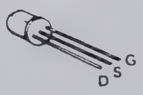
2SA778A 2SC1775
2SA1015 2SC1815
2SC945 2SC1923
2SC1515 2SC1959
2SC1675 2SC2240



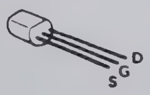
2SC460



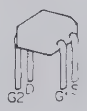
2SK19



2SK125
2SK30A



3SK73



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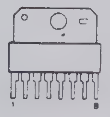

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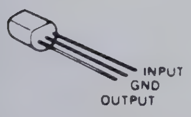
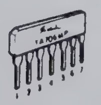
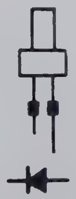


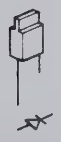
µPC1158H2



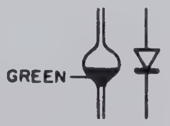
SLP-144



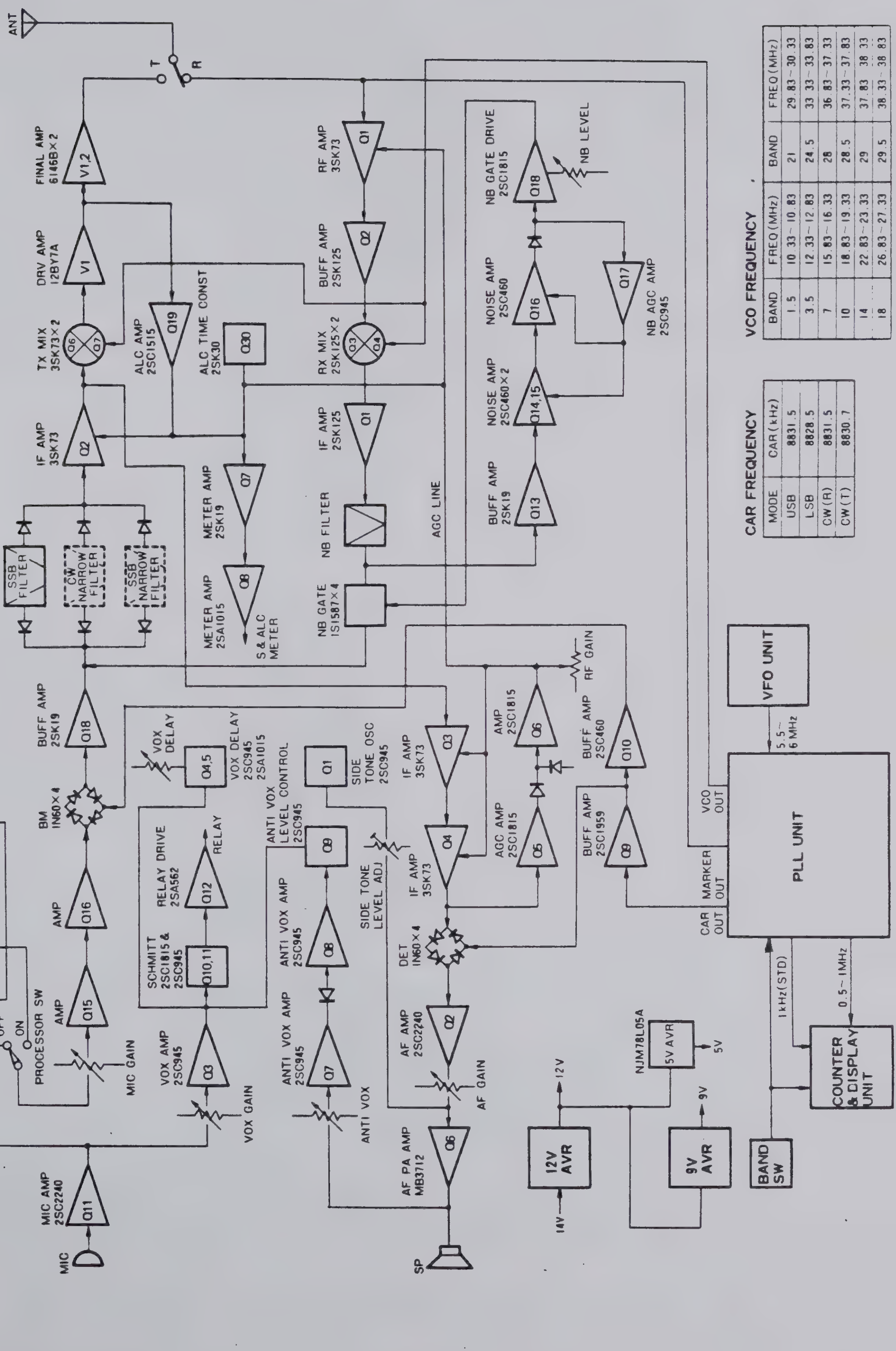
TLR-205



MV-13



BLOCK DIAGRAM



CAR FREQUENCY

MODE	CAR(kHz)
USB	8831.5
LSB	8828.5
CW(R)	8831.5
CW(T)	8830.7

VCO FREQUENCY

BAND	FREQ(MHz)	BAND	FREQ(MHz)
1.5	10.33~10.83	21	29.83~30.33
3.5	12.33~12.83	24.5	33.33~33.83
7	15.83~16.33	28	36.83~37.33
10	18.83~19.33	28.5	37.33~37.83
14	22.83~23.33	29	37.83~38.33
18	26.83~27.33	29.5	38.33~38.83

SPECIFICATIONS

GENERAL

Frequency Range	160 m Band 1.8~2.0 MHz
	80 m Band 3.5~4.0 MHz
	40 m Band 7.0~7.3 MHz
	* 30 m Band 10.1~10.15 MHz
	(10.0 MHz WWV)
	20 m Band 14.0~14.35 MHz
	* 17 m Band 18.068~18.168 MHz
	15 m Band 21.0~21.45 MHz
	* 12 m Band 24.89~24.99 MHz
	10 m Band 28.0~29.7 MHz
Modes	SSB/CW
Frequency Stability	Within 1 kHz during the first hour after 1 minute of warmup.
	Within 100 Hz during any 30 minute period after warmup.
Power Requirement	120V AC (220,240V modifiable) 50/60 Hz : (K)
	120/220V AC (Selectable) 50/60 Hz : (M)
	220/240V AC (Selectable) 50/60 Hz : (T)(W)(X)
Power Consumption	Transmit : 295 watts
	Receive : 27 watts (with heaters off)
Dimensions	333 (13.3) x 133 (5.3) x 333 (13.3) mm (inch)
Weight	12.8 kg (28.2 lbs)

(K) : USA
(T) : Britain
(W) : Europe
(X) : Australia
(M) : General market

TRANSMITTER

* Final Power Input	220W PEP for SSB operation
	180W DC for CW operation
Audio Input Impedance	500Ω~50kΩ
RF Output Impedance	50Ω~75Ω
Carrier Suppression	Better than 40 dB
Sideband Suppression	Better than 50 dB
Spurious Radiation	Better than 60 dB
Harmonic Radiation	Better than 40 dB
Audio Freq. Response	400 to 2,600 Hz within –6 dB

RECEIVER

Receiver Sensitivity	0.25μV at 10 dB S + N/N
Image Ratio	Better than 60 dB
IF Rejection	Better than 70 dB
Receiver Selectivity	
SSB/CW	2.4 kHz (–6 dB), 4.2 kHz (–60 dB)
	CW Optional Filter
	YK-88C 500 Hz (–6 dB), 1.5 kHz (–60 dB)
	YK-88CN 270 Hz (–6 dB), 1.1 kHz (–60 dB)
	SSB Optional Filter
	YK-88SN 1.8 kHz (–6 dB), 3.3 kHz (–60 dB)
Audio Output Impedance	8~16Ω
Audio Output	1.5 W (8Ω)

* Will transmit on the new 30, 17, and 12 meter bands. Diodes installed for preventing accidental transmission before government Amateur authorization.

NOTE : The circuit and ratings may change without notice due to developments in technology.

CIRCUIT DESCRIPTION

This is mixed with the VCO output for each band by MIX (1) to a frequency given in **Table 4**, which is then routed through LPF (1), amplified, and wave-shaped to a digital signal. A programmable divider divides this signal into a 500 kHz output. This programmable divider is preset, as shown in **Table 4**, by the BCD signal which is counter-generated from information coming from the band switch. The phase comparator used is a Motorola MC4044P. The loop filter is made of completely discrete components to minimize VCO spurious content.

Six VCOs cover all bands. If the PLL unlocks for any reason, it will be detected from the phase comparator output. This will turn off the VCO output to prevent spurious radiation and, at the same time, the display will be blanked to inform the operator of unlock status.

BAND	RX. Tx frequency (MHz)	VCO (MHz)	MIX (1) input (MHz)	MIX (1) output (MHz)	Division ratio	DCBA
1.5	1.5 ~2.0	10.33 ~10.83	14.33 ~14.83	4.0	1/8	1 0 0 0
3.5	3.5 ~4.0	12.33 ~12.83	14.33 ~14.83	2.0	1/4	1 1 0 0
7	7.0 ~7.5	15.83 ~16.33	14.33 ~14.83	1.5	1/3	1 1 0 1
10	10.0 ~10.5	18.83 ~19.33	14.33 ~14.83	4.5	1/9	0 1 1 1
14	14.0 ~14.5	22.83 ~23.33	24.33 ~24.83	1.5	1/3	1 1 0 1
18	18.0 ~18.5	26.83 ~27.33	24.33 ~24.83	2.5	1/5	1 0 1 1
21	21.0 ~21.5	29.83 ~30.33	34.33 ~34.83	4.5	1/9	0 1 1 1
24.5	24.5 ~25.0	33.33 ~33.83	34.33 ~34.83	1.0	1/2	1 1 1 0
28	28.0 ~28.5	36.83 ~37.33	″	2.5	1/5	1 0 1 1
28.5	28.5 ~29.0	37.33 ~37.83	″	3.0	1/6	1 0 1 0
29	29.0 ~29.5	37.83 ~38.33	″	3.5	1/7	1 0 0 1
29.5	29.5 ~30.0	38.33 ~38.83	″	4.0	1/8	1 0 0 0

Table 3 Frequency chart

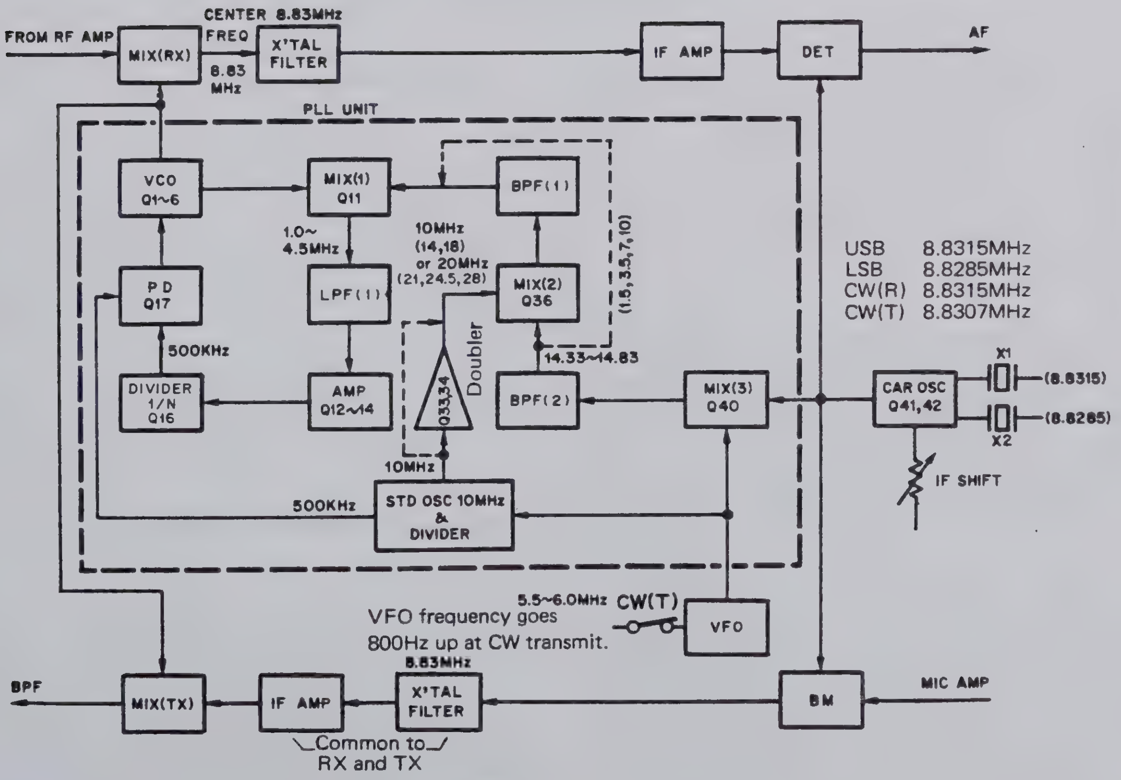


Fig. 1 TS-530 Frequency configuration

CIRCUIT DESCRIPTION

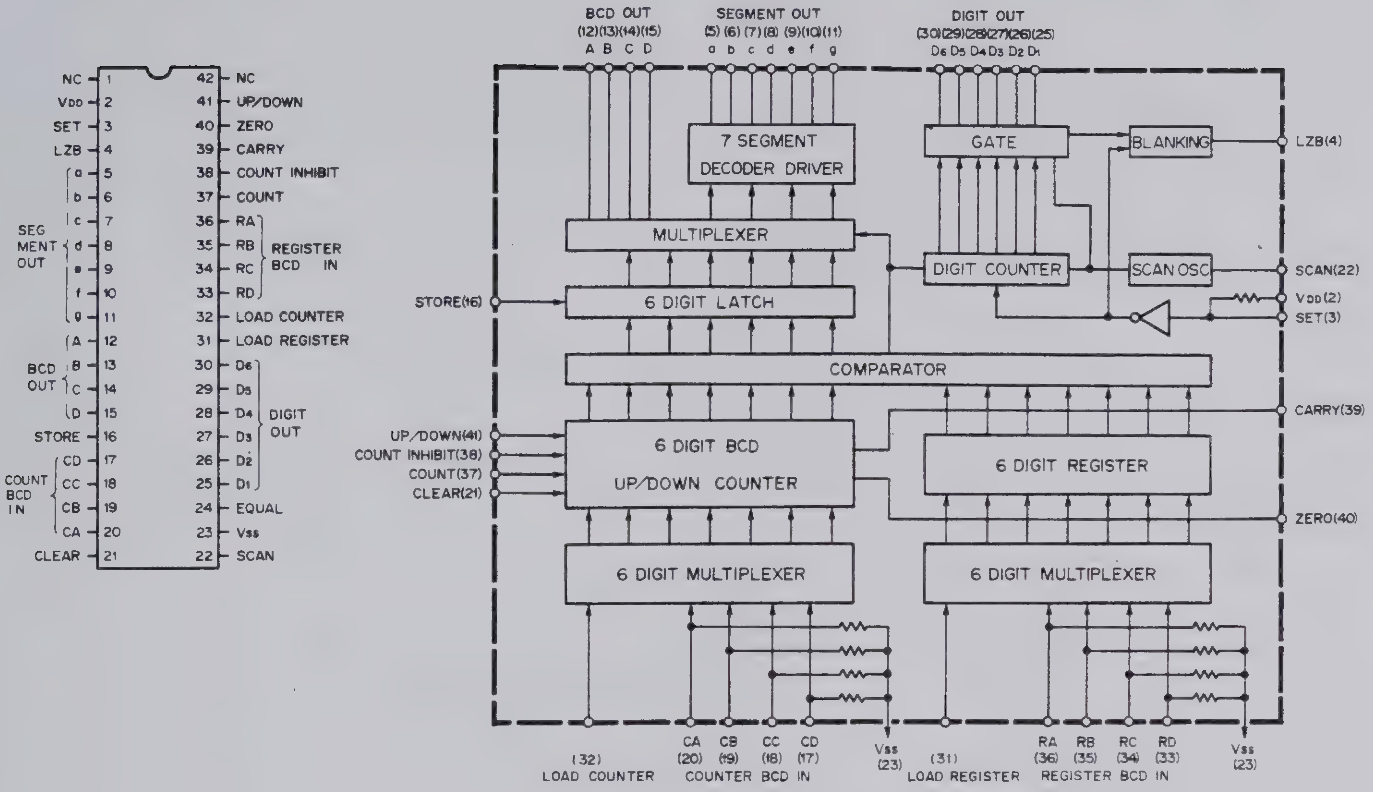

NC 1
VDD 2
SET 3
LZB 4
SEGMENT OUT a 5, b 6, c 7, d 8, e 9, f 10, g 11
BCD OUT A 12, B 13, C 14, D 15
STORE 16
COUNT BCD IN CD 17, CC 18, CB 19, CA 20
CLEAR 21
42 NC
41 UP/DOWN
40 ZERO
39 CARRY
38 COUNT INHIBIT
37 COUNT
36 RA, 35 RB, 34 RC, 33 RD REGISTER BCD IN
32 LOAD COUNTER
31 LOAD REGISTER
30 D6, 29 D5, 28 D4, 27 D3, 26 D2, 25 D1 DIGIT OUT
24 EQUAL
23 Vss
22 SCAN
BCD OUT (12)(13)(14)(15) A B C D
SEGMENT OUT (5) (6) (7) (8) (9) (10) (11) a b c d e f g
DIGIT OUT (30)(29)(28)(27)(26)(25) D6 D5 D4 D3 D2 D1
7 SEGMENT DECODER DRIVER
GATE
BLANKING
LZB(4)
MULTIPLEXER
DIGIT COUNTER
SCAN OSC
SCAN(22)
VDD(2)
SET(3)
STORE(16)
6 DIGIT LATCH
COMPARATOR
CARRY(39)
UP/DOWN(41)
COUNT INHIBIT(38)
COUNT(37)
CLEAR(21)
6 DIGIT BCD UP/DOWN COUNTER
6 DIGIT REGISTER
ZERO(40)
6 DIGIT MULTIPLEXER
6 DIGIT MULTIPLEXER
(32) LOAD COUNTER
CA (20) CB (19) CC (18) CD (17) COUNTER BCD IN
Vss (23)
(31) LOAD REGISTER
RA (36) RB (35) RC (34) RD (33) REGISTER BCD IN
Vss (23)

Fig. 4 TS5070P (Counter unit, Q5)

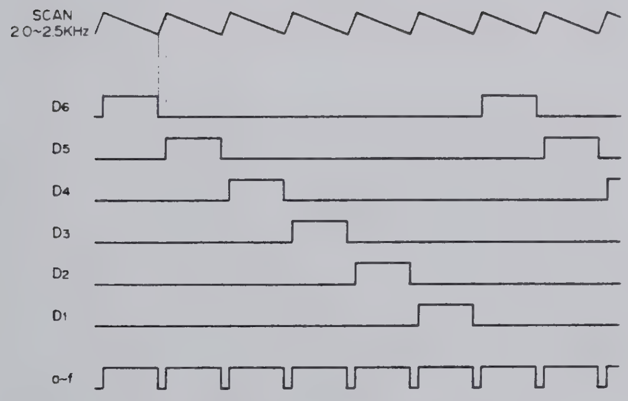
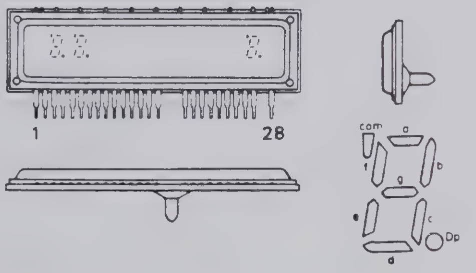


Fig. 5 TC5070P Timing chart



PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CONNECTION	F	N_C	G_9	N_C	N_C	G_8	g	f	G_7	e	d	G_6	N_C	N_C
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	G_5	N_P	N_P	G_4	D_P	G_3	c	b	G_2	a	COM	G_1	N_P	F

Fig. 6 Indicating tube 9-BT-12

Q5 (TC5070P) is a presettable, 6-digit BCD counter which incorporates a 6-digit latch, 6-digit dynamic drive digital counter, and 7-segment decoder/driver. Band information supplied from the RF unit is applied to a diode matrix to preset the 100 kHz, 1 MHz and 10 MHz digits. Preset values are given in **Fig. 3**. For instance, to preset 14.000 MHz, with a 500 kHz counter input signal, the 10 MHz value is preset to 1, 1 MHz to 3, and 100 kHz to 5, and the 500 kHz counter input signal is subtracted from 14.000 MHz. (If no counter input signal were present, 13.500 MHz would be displayed). Q5 supplies the display tube drivers with 7-segment information and dynamic drive control signals to light the fluorescent display tube.

In the counter unit, a diode matrix generates frequency division information and supplies the PLL unit with this information. If the PLL unlocks, a BLK (Blanking Low) signal will be applied to the digit driver IC (Q11) to blank the fluorescent display tube.

2. IF SHIFT operation

The IF SHIFT circuit shifts the passband of the IF circuit without changing the receiving frequency. The relative position of the passband of the IF filter to the received signal is shifted when the IF SHIFT control is turned as shown in **Fig. 7** . The IF SHIFT circuit block diagram is shown in **Fig. 8** .

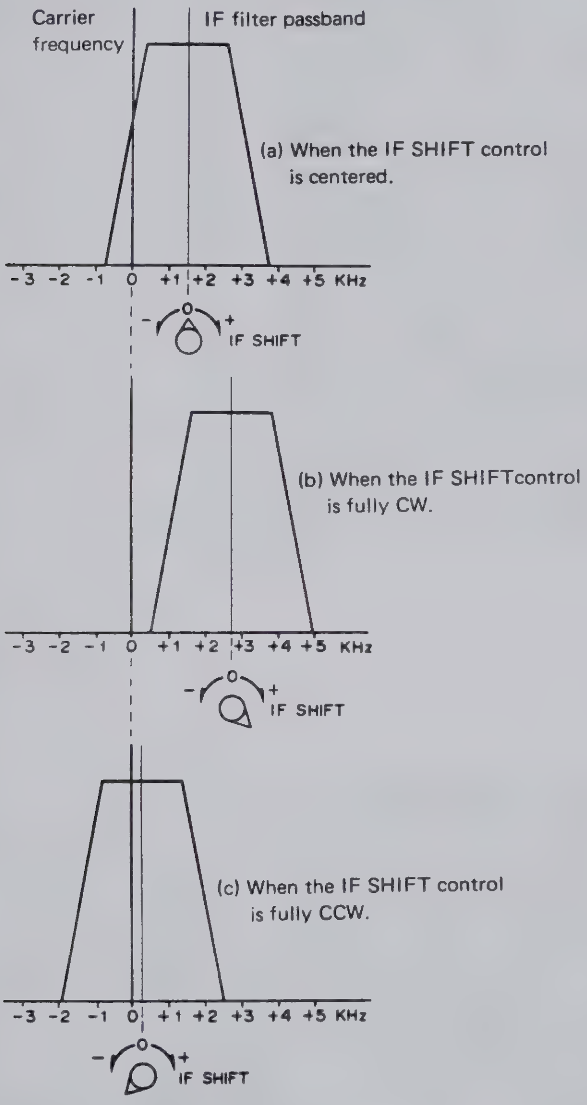

Carrier frequency
IF filter passband
(a) When the IF SHIFT control is centered.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT
(b) When the IF SHIFTcontrol is fully CW.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT
(c) When the IF SHIFT control is fully CCW.
-3 -2 -1 0 +1 +2 +3 +4 +5 KHz
- 0 +
IF SHIFT

Fig. 7 IF SHIFT operation (for USB mode)

Frequencies within the PLL loop satisfy the following relationship.

$$N \cdot 500\,\text{kHz} \fallingdotseq f_{BPF1} - f_{VCO} \qquad (1)$$

where N : divisor of programmable divider
500 kHz : phase reference frequency
f_{BPF1} : input frequency to MIX (1)
f_{VCO} : VCO frequency

For example, in the case of 14 MHz reception, f_{BPF1} is given by eq. (1) as

$$f_{BPF1} = 10\,\text{MHz} + f_{BPF2} \qquad (2)$$

where 10 MHz : band setting frequency

$$f_{BPF2} = f_{VFO} + f_{CAR} \qquad (3)$$

where f_{VFO} : VFO frequency
f_{CAR} : carrier frequency

By substituting eq. (3) into eq.(2) and eq.(2) into eq.(1)

$$f_{VCO} = 10\,\text{MHz} + f_{VFO} + f_{CAR} - N \cdot 500\,\text{kHz}$$

$$\therefore f_{CAR} = f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})$$

Assuming that f_{VFO} is constant, when f_{CAR} is varied by $\pm\Delta f$,

$$\begin{aligned} f_{CAR} \pm \Delta f &= [f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})] \pm \Delta f \\ &= (f_{VCO} \pm \Delta f) + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO}) \end{aligned}$$

Thus, f_{VCO} varies by $\pm\Delta f$ as f_{CAR} is varied by $\pm\Delta f$.

The receiving frequency, f_R is given by

$$f_R = f_{VCO} - f_{CAR} \qquad (4)$$

Therefore, when f_{CAR} is shifted by $+\Delta f$, receiving frequency f'_R is given by

$$\begin{aligned} f'_R &= (f_{VCO} + \Delta f) - (f_{CAR} + \Delta f) \\ &= f_{VCO} - f_{CAR} \qquad (5) \end{aligned}$$

From equations (4) and (5),

$$f_R = f'_R$$

Thus the receiving frequency does not vary even if f_{CAR} is varied. However,

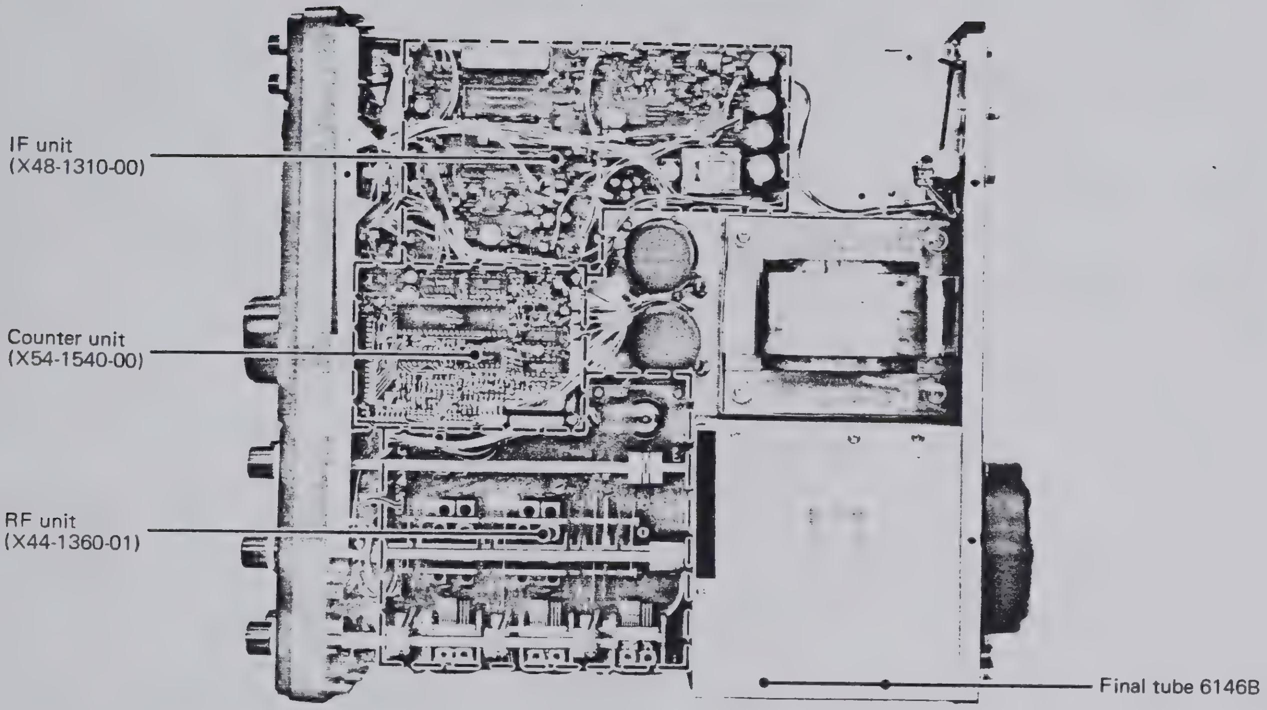
$$f_R = f_{VCO} - \text{IF frequency}$$

so the IF frequency varies as f_{VCO} varies.

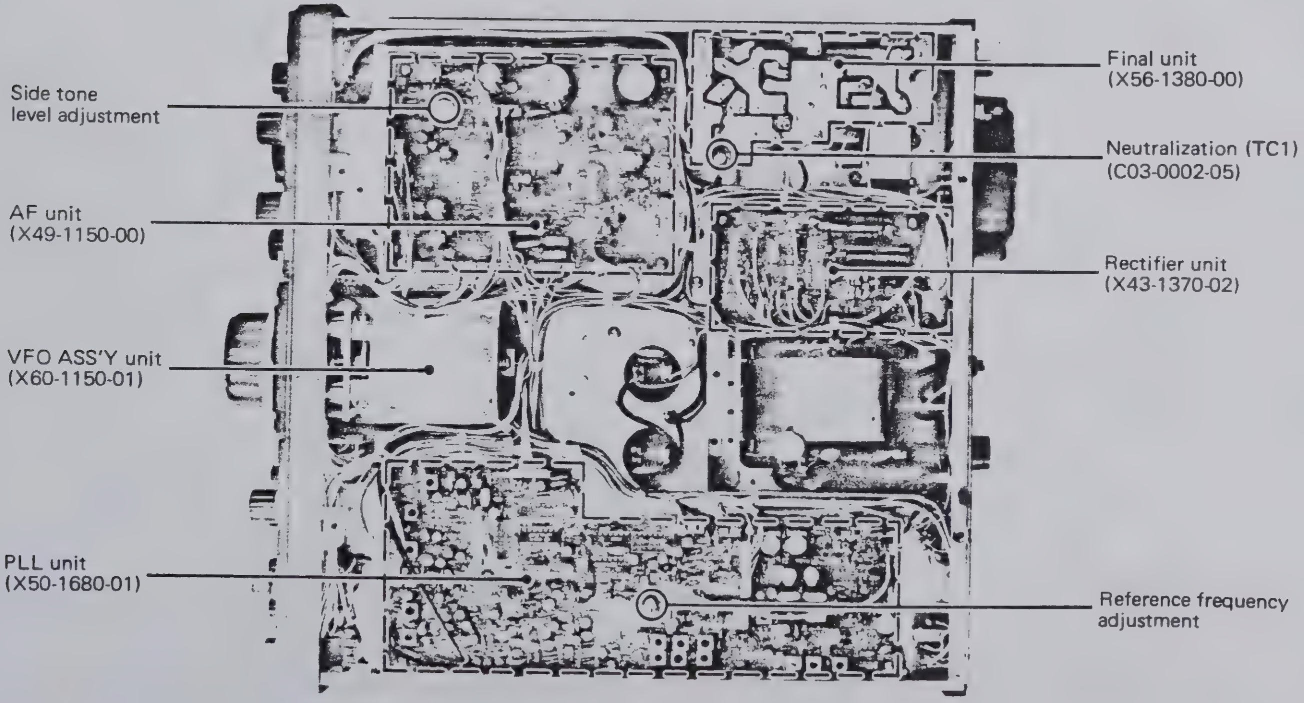
This means that the relative position of the IF filter passband to the carrier position (of the received signal) is shifted by the same amount as the f_{VCO} variation.

INSIDE VIEWS

TOP VIEW

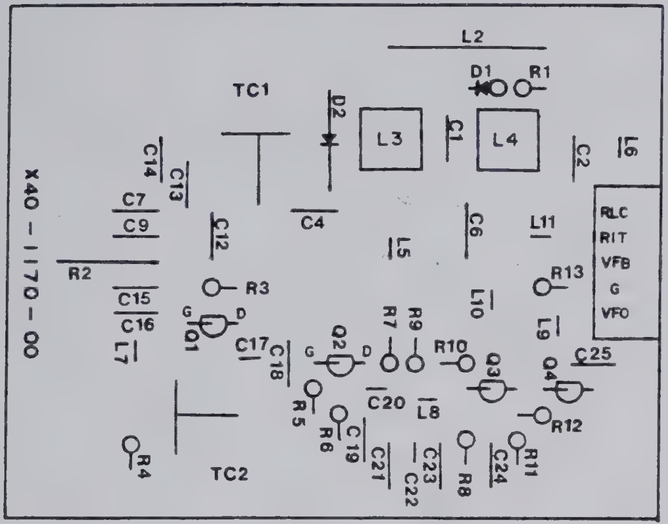


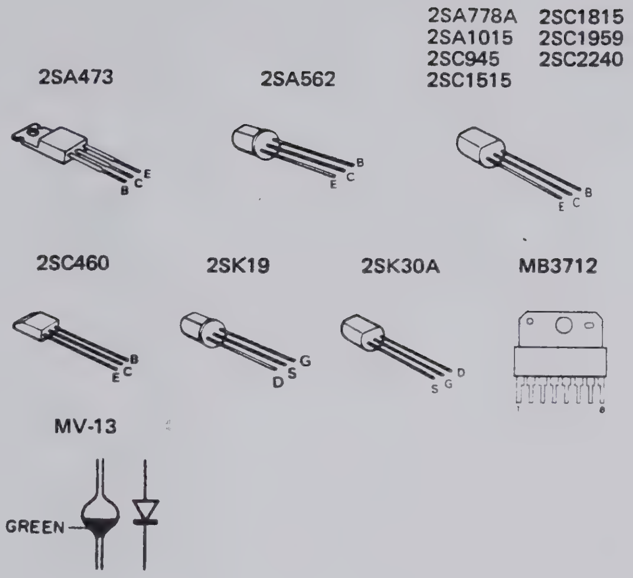
BOTTOM VIEW



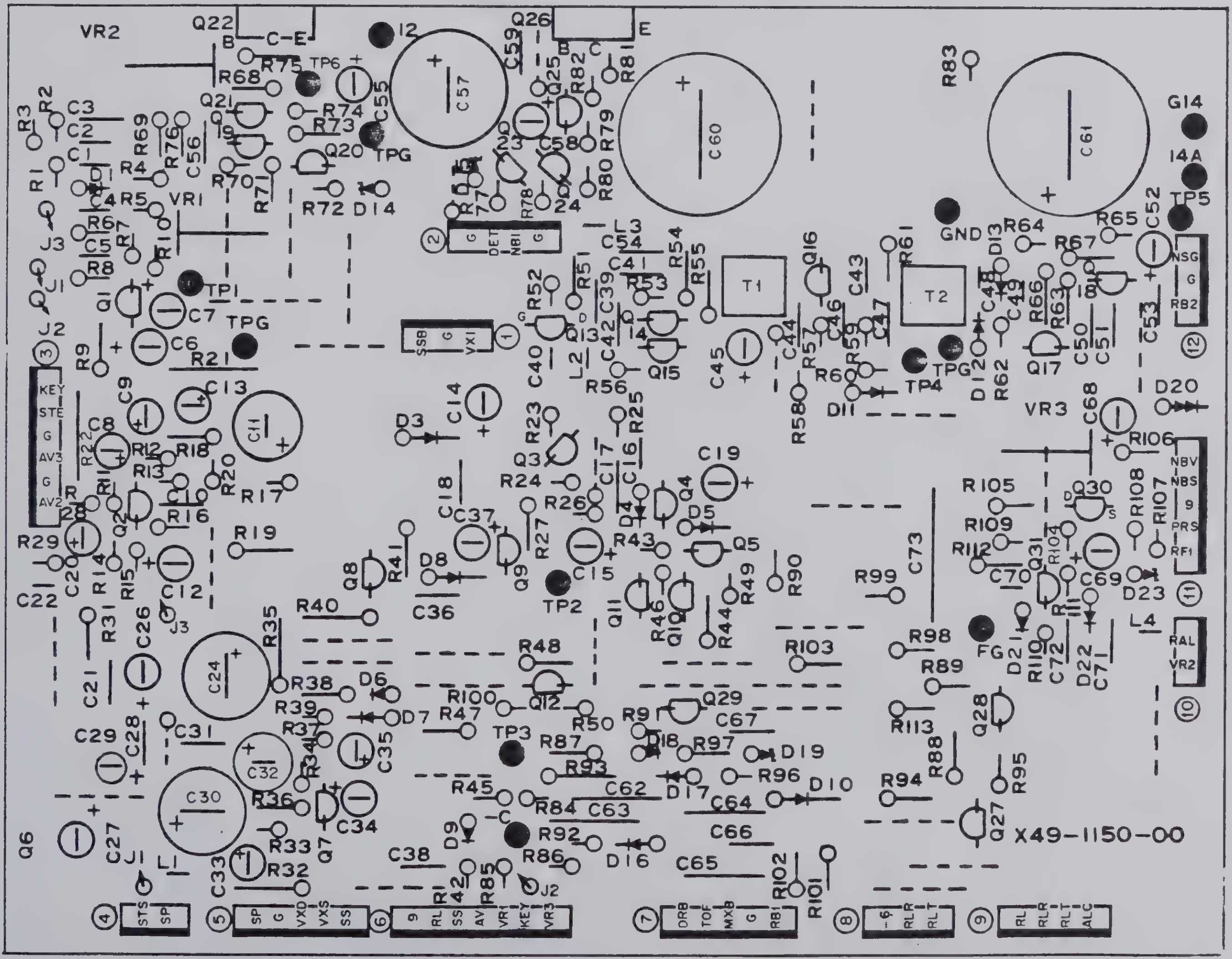
TS-530S PC BOARD VIEWS

▼ VFO UNIT (X40-1170-00) View from component side



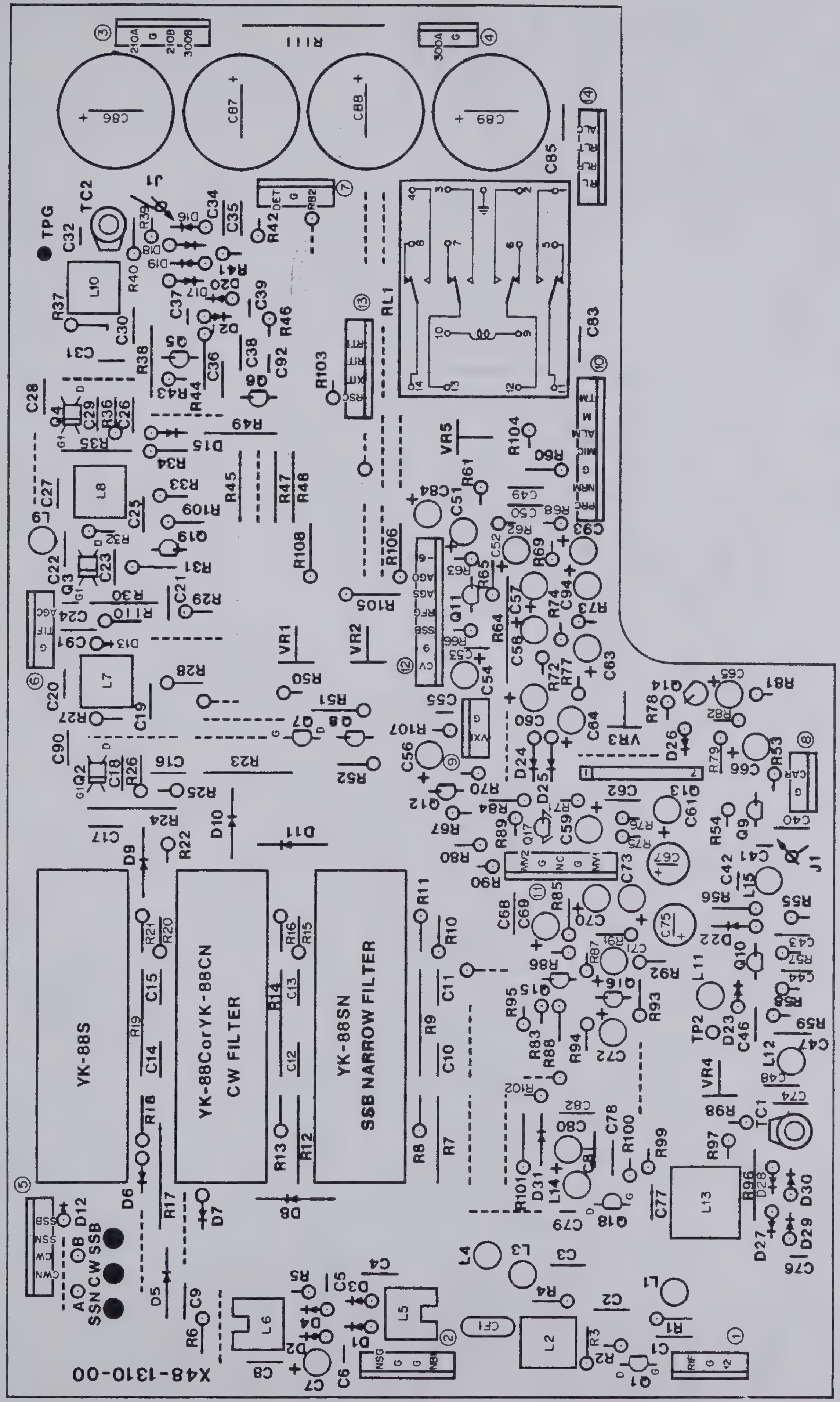


▼ AF UNIT (X49-1150-00) View from component side

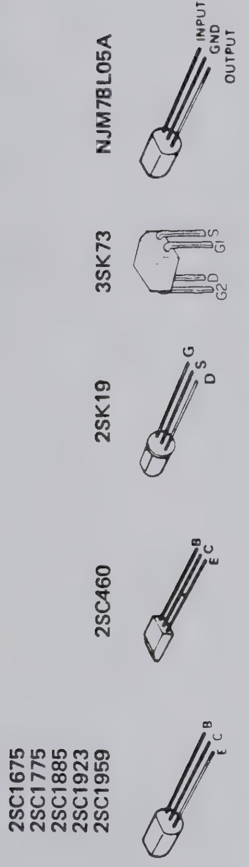


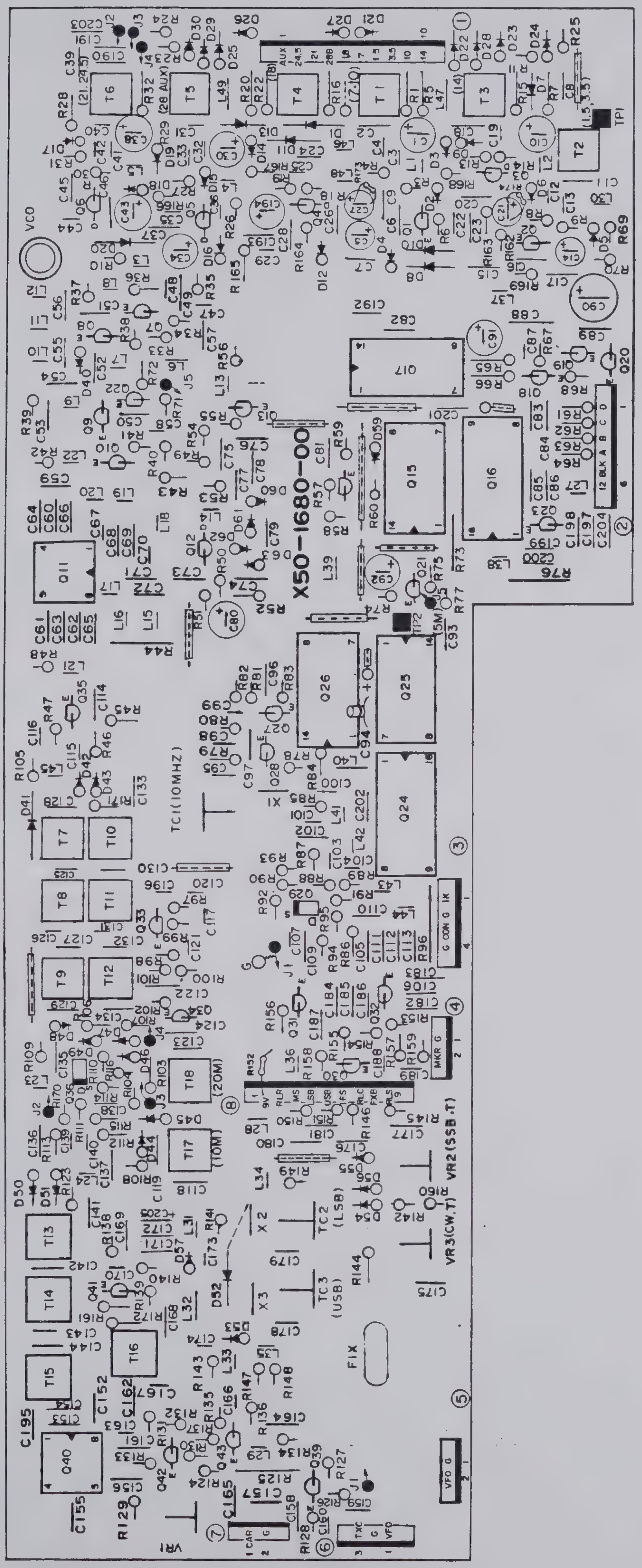
TS-530S PC BOARD VIEW

▼IF UNIT (X48-1310-00) View from component side



TS-530S PC BOARD VIEW

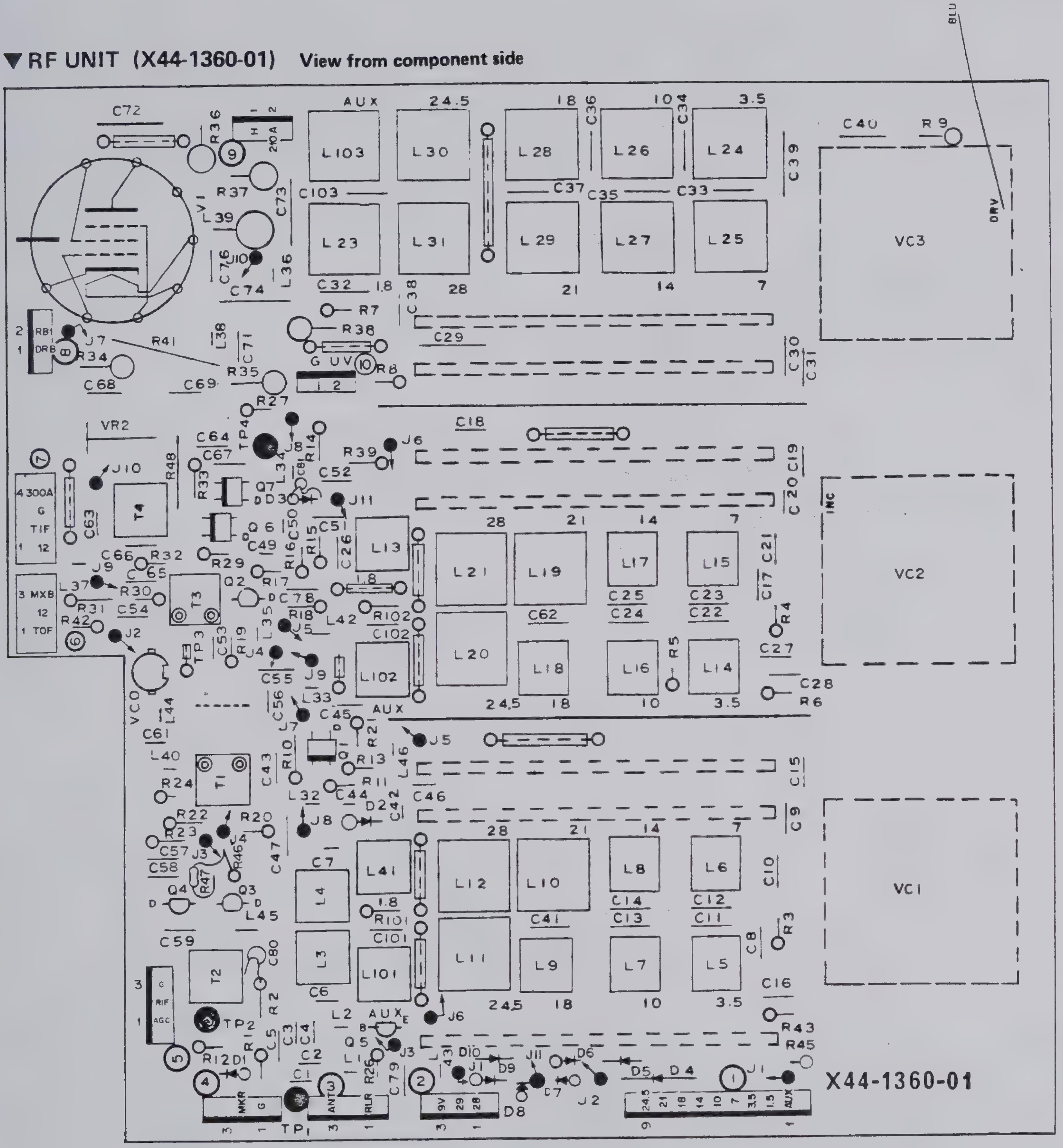




▼ PLL UNIT (X50-1680-01) View from component side

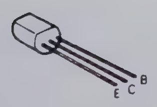
S-530S PC BOARD VIEW

▼RF UNIT (X44-1360-01) View from component side

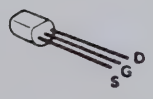


D1, 6, 7 : 3SK73(GR) Q2~4 : 2SK125 Q5 : 2SC1815(Y) D1 : 1S1587 D2, 3 1S2588 D4~10 : 1S1555 V1 : 12BY7A

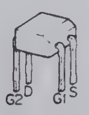
2SC1815



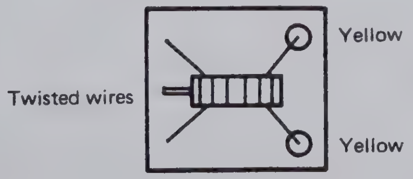
2SK125



3SK73



Attachment method of T1,T2



PARTS LIST

Note 1:
K: U.S.A. T: Britain W: Europe X: Australia

Note 2:
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration. Resistors not otherwise detailed are carbon type (1/4W or 1/8W).
Order carbon resistors and capacitors according to the following example:

A carbon resistor's part number is RD14BY 2E222J.

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

RESISTOR

1. Type of the carbon resistor

RD14BY
RD14BB (small size)

RD14CY
RD14CB (small size)

2. Wattage

1W → 3A 3W → 3F 5W → 3H
2W → 3D 4W → 3G

3' = CC45 ○ ○ ...
Ceramic capacitor (type I) temperature coeff. capacitor 1' 3'

1st word (Color)	C (Black)	L (Red)	P (Orange)	R (Yellow)	S (Green)	T (Blue)	U (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

3 = CK45 ○
Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

6 = Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10 μF −10 ~ +50 Less than 4.7 μF −10 ~ +75

Less than 10 pF

Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

Abbreviation		Abbreviation	
Cap.	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

3. **Resistance value**

②② ② → means 22×10^2 = 2200Ω (2.2 kΩ)

Example 221 → 220Ω 223 → 22 kΩ 225 → 2.2 MΩ
222 → 2.2 kΩ 224 → 220 kΩ

4. **Tolerance**

J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

CC	45	TH	1H	220	J
1'	2	3'	4	5	6

Type II

CK	45	F	1H	103	Z
1	2	3	4	5	6

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ..... round, square, etc.
3 = Temp range
3' = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

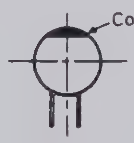
Ex. CC45TH = −470 ±60 ppm/°C

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

5 = Capacitor value

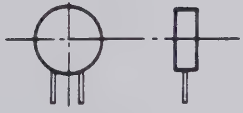
Example: 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001 μF
103 → 0.01 μF

CC45



Type I

CK45



Type II

TS-530 SEMICONDUCTOR

☆: New parts

Item	Name	Parts No.	Remarks
Diode	1N60	V11-0051-05	
	1S1007	V11-4160-66	
	1S1555	V11-0076-05	
	1S1587	V11-0370-05	
	1S2588	V11-0414-05	
	V03C	V11-0290-05 200V 1.3A	
	V06B	V11-0219-05 100V 1.1A	
	V06E	V11-0285-05 400V 1.1A	
	V08J	V11-0282-05 800V 1.1A	
Varistor	MV-13	V21-0004-05	
Vari-cap diode	1SV53A	V11-4161-36	
	1SV54GC	V11-4173-46	☆
LED	SLP-144	V11-6172-76	
	TLR-205	V11-3162-96	
Zener diode	WZ-061	V11-0243-05	
	WZ-090	V11-0240-05	
	WZ-110	V11-4161-46	
	XZ-055	V11-4105-50	
	XZ-060	V11-4101-20	
	XZ-090	V11-4167-06	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
	E22-0207-05	Lug plate	
	E22-0472-05	Lug plate Final	☆
	E23-0046-04	Square terminal Switch, Relay	
	E30-0181-05	AC cord UL/CSA K, M	
	E30-0185-05	AC cord SAA X	
	E30-0585-05	AC cord CEE W	
	E30-0602-05	AC cord 3P T	
	E31-2086-05	Coax cable with plug	
	E90-0004-15	Plate cap	
	F05-4022-05	Fuse 4A W, T, X, M	
	F05-6021-05	Fuse 6A K, M	
	F09-0041-05	Fan	
	G01-0801-04	Gnd spring	
	G09-0410-05	D spring φ6	
	G13-0633-14	Cushion Meter	
	G13-0639-04	Cushion Indicating tube	
	G53-0502-04	Packing Case side	
	G53-0512-04	Packing Panel	
	H01-2741-04	Carton case (inside) K, W, X, M	☆
	H01-2742-04	Carton case (inside) T	☆
	H03-1797-04	Carton case (outside)	☆
	H10-2539-02	Packing fixture (F)	
	H10-2540-02	Packing fixture (R)	
	H20-0439-03	Protective cover	
	H25-0120-04	Protective bag	
	J02-0022-05	Foot (small)	
	J02-0049-14	Foot (large)	
	J13-0033-15	Fuse holder	
	J25-3015-04	PC board Relay	☆
	J32-0029-04	Hex. boss Relay, PLL	
	J32-0159-04	Hex. boss Final	
	J41-0006-05	Cord bushing K, M	
	J41-0024-15	Cord bushing W, T, X	
	J42-0409-04	Knob bushing +0.5 SHIFT	
	J61-0019-05	Vinyle tie	
	J61-0401-05	Nylon band	
	J61-0402-05	Free up belt W	
	K01-0406-05	Handle	☆
	K21-0723-04	Pointer knob BAND	
	K23-0738-04	Knob 1 METER, AGC	
	K23-0745-04	Knob VOX, NB, CAR	☆
	K27-0414-04	Push knob	
	K29-0713-04	Push knob +0.5 SHIFT	
	K29-0715-04	Pointer knob MODE	
	K29-0737-04	Knob 5 PLATE	
	K29-0738-04	Knob 6	
	K29-0744-04	Paddle knob STBY	☆
L1	L40-6891-13	Choke coil 6.8μH	
L2	L33-0635-05	Final choke	
L3	L34-1004-05	Final coil B 28 MHz	
L4	L34-0560-25	Final coil A	
L5	L33-0259-05	Choke coil 470μH	
T1	L01-8106-15	Power trans	
PS1,2	L39-0046-05	PS coil PLATE	
	N09-0256-05	Gnd screw	

Ref. No.	Parts No.	Description	Remarks
	N14-0115-05	Flange nut GND	
	N14-0509-05	Wing nut GND	
	N14-0517-05	Cap nut BIAS	
	N30-4012-46	Round screw Foot (large)	
	N30-4016-46	Round screw GND	
	N30-4025-46	Round screw Foot (accessory)	
	N33-3006-41	Round flat screw SP	
	N35-3008-45	Bind screw Foot (small)	
	N35-4006-41	Bind screw Case	
	N87-4012-46	Self tapping screw Foot (large)	
	N89-3006-46	Bind tapping screw Final cover	
	N99-0306-04	Hex. head screw VFO	
R22	RC05GF2H221J	Solid 220Ω 1/2W	
R24	RC05GF3A103K	Solid 10kΩ 1W	
R25,26	RC05GF2H474J	Solid 470kΩ 1/2W	
R28	RC05GF2H330J	Solid 33Ω 1/2W	
VR1	R01-3414-05	Pot. 10kΩ(A) AF	☆
VR2	R01-3415-05	Pot. 10kΩ(B) RF	☆
VR3	R01-3417-05	Pot. 10kΩ(F) IF SHIFT	☆
VR4	R01-2405-05	Pot. 5kΩ(B) RIT/XIT	
VR5	R01-3414-05	Pot. 10kΩ(A) MIC	☆
VR6	R01-3416-05	Pot. 10kΩ(B) CAR	☆
VR7	R01-4408-05	Pot. 50kΩ(B) VOX GAIN	☆
VR8	R01-0404-05	Pot. 300Ω(B) NB	
VR9	R01-6401-05	Pot. 250kΩ(B) DELAY	
VR10	R01-0405-05	Pot. 300Ω(B) ANTI	☆
VR11,12	R01-3411-05	Pot. 10kΩ(B) RF OUT, BIAS	
S1~6	S40-2419-05	Push switch PC board type	
S7	S40-2403-05	Push switch +0.5 SHIFT	
S8,9	S36-1403-05	See saw switch HEATER, POWER	☆
S11	S01-1423-05	Rotary switch AGC	
S13	S01-1427-05	Rotary switch METER	☆
S14,16	S40-2415-05	Push switch Lead type	
S17	S33-2403-05	Paddle switch STBY	☆
S18	S01-2429-05	Rotary switch MODE	☆
S20	S31-2007-05	Slide switch SG	
S22	S01-3406-05	Rotary switch FINAL	
S23	S31-2027-05	Slide switch AC volt W,T,X,M	
RL1	S51-2407-05	Relay	
	T07-0215-05	Speaker	☆
	T40-0022-05	Motor FAN	
	X43-1370-02	Rectifier unit	☆
	X44-1360-01	RF unit	☆
	X48-1310-00	IF unit	☆
	X49-1150-00	AF unit	☆
	X50-1680-01	PLL unit	☆
	X54-1540-00	Counter unit	
	X56-1380-00	Final unit	
	X60-1150-01	VFO ass'y unit	☆

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
L44	L40-2282-01	Ferri-inductor 0.22μH	
L45,46	L40-1511-03	Ferri-inductor 150μH	
T1	L19-0303-05	Wide bandwidth trans	
T2	L30-0509-05	IFT	
T3	L19-0303-05	Wide bandwidth trans	
T4	L30-0509-05	IFT	
R34	RC05GF2H104J	Solid 100kΩ 1/2W	
R35	RC05GF2H151J	Solid 150Ω 1/2W	
R36	RC05GF2H104J	Solid 100kΩ 1/2W	
R37	RS14AB3A332J	Metal film 3.3kΩ 1W	
R38	RC05GF2H474J	Solid 470kΩ 1/2W	
VR2	R12-6404-05	Trim. pot 470kΩ	
	R92-0150-05	Short jumper	
	S29-7401-05	Rotary wafer ass'y	

IF UNIT (X48-1310-00)

Ref. No.	Parts No.	Description	Remarks
C2	C91-0457-05	C 0.022μF	
C5,6	CC45SL1H470J	C 47pF	
C7	CE04W1C100M	E 10μF 16V	
C9~15	C91-0457-05	C 0.022μF	
C18	C91-0456-05	C 0.047μF	
C19	C91-0457-05	C 0.022μF	
C20	CC45SL1H100D	C 10pF ±0.5pF	
C23	C91-0457-05	C 0.022μF	
C24	CC45SL1H100D	C 10pF ±0.5pF	
C25	C91-0457-05	C 0.022μF	
C26	C91-0456-05	C 0.047μF	
C27	CC45SL1H470J	C 47pF	
C28	C91-0456-05	C 0.047μF	
C29	C91-0457-05	C 0.022μF	
C30	C91-0456-05	C 0.047μF	
C31	CC45SL1H100D	C 10pF ±0.5pF	
C32	CC45UJ1H070D	C 7pF ±0.5pF	
C35	CQ92M1H333K	ML 0.033μF	
C36	C91-0456-05	C 0.047μF	
C37	CC45SL1H470J	C 47pF	
C38	C91-0457-05	C 0.022μF	
C40	C91-0456-05	C 0.047μF	
C44,47	CC45SL1H470J	C 47pF	
C49,50	CC45SL1H101J	C 100pF	
C51	CE04W1H010M	E 1μF 50V	
C52	CE04W1C100M	E 10μF 16V	
C53	CQ92M1H153K	ML 0.015μF	
C54,56~58	CE04W1H010M	E 1μF 50V	
C59	CE04W1H3R3M	E 3.3μF 50V	
C60,61,63	CE04W1H010M	E 1μF 50V	
C64	CE04W1H4R7M	E 4.7μF 50V	
C65	CE04W1C100M	E 10μF 16V	
C66	CE04W1H4R7M	E 4.7μF 50V	
C67	CE04W1A221M	E 220μF 10V	
C68	CQ92M1H473K	ML 0.047μF	
C69	CE04W1A470M	E 47μF 10V	
C70	CE04W1C100M	E 10μF 16V	
C71	CE04W1H010M	E 1μF 50V	
C72	CE04W1H3R3M	E 3.3μF 50V	
C73	CE04W1H010M	E 1μF 50V	
C74	C91-0457-05	C 0.022μF	
C75	CE04W1A221M	E 220μF 10V	
C76	CC45UJ1H100D	C 10pF ±0.5pF	
C77	CC45SL1H101J	C 100pF	
C78	C91-0457-05	C 0.022μF	
C79	CC45CH1H050C	C 5pF ±0.25pF	
C80	CE04W1C220M	E 22μF 16V	
C84	CE04W1H010M	E 1μF 50V	
C85	C91-0456-05	C 0.047μF	
C86~89	CE04W2V220	E 22μF 350V	
C91,92	CC45SL1H470J	C 47pF	
C93,94	CE04W1C100M	E 10μF 16V	
TC1,2	C05-0030-15	Ceramic trimmer 20pF	
	E23-0401-05	Round terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0573-05	Mini connect wafer 5P	
	E40-0773-05	Mini connect wafer 7P	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-1511-03	Ferri-inductor 150μH	
L2	L34-0940-05	Tuning coil	
L3,4	L40-1511-03	Ferri-inductor 150μH	
L5	L34-0942-05	Tuning coil	
L6	L34-0997-05	Tuning coil	
L7,8	L34-0535-05	Tuning coil	
L9	L40-1511-03	Ferri-inductor 150μH	
L10	L34-0536-05	Tuning coil	
L11,12	L40-1511-03	Ferri-inductor 150μH	
L13	L34-0567-05	Tuning coil BM	
L14	L40-4711-03	Ferri-inductor 470μH	
L15	L40-1511-03	Ferri-inductor 150μH	
CF1	L72-0324-05	Ceramic filter 8.83MHz NB	☆
XF1	L71-0208-05	MCF YK-88S	
R111	RS14GB3D471J	Metal film 470Ω 2W	
VR1	R12-3045-05	Trim. pot 10kΩ	
VR2	R12-6401-05	Trim. pot 470kΩ	
VR3	R12-5030-05	Trim. pot 100kΩ	
VR4	R12-0401-05	Trim. pot 100Ω	
VR5	R12-3045-05	Trim. pot 10kΩ	
	R92-0150-05	Short jumper	
RL1	S51-4401-05	Relay LZN-4	

AF UNIT (X49-1150-00)

Ref. No.	Parts No.	Description	Remarks
C1,2	CQ92M1H123K	ML 0.012μF	
C3	CQ92M1H223K	ML 0.022μF	
C4,5	CQ92M1H123K	ML 0.012μF	
C6	CE04W1C100M	E 10μF 16V	
C7	CE04W1H010M	E 1μF 50V	
C8	CE04W1HR10M	E 0.1μF 50V	
C9	CE04W1C100M	E 10μF 16V	
C10	CQ92M1H103K	ML 0.01μF	
C11	CE04W1A101M	E 100μF 10V	
C12	CE04W1HR47M	E 0.47μF 50V	

PARTS LIST

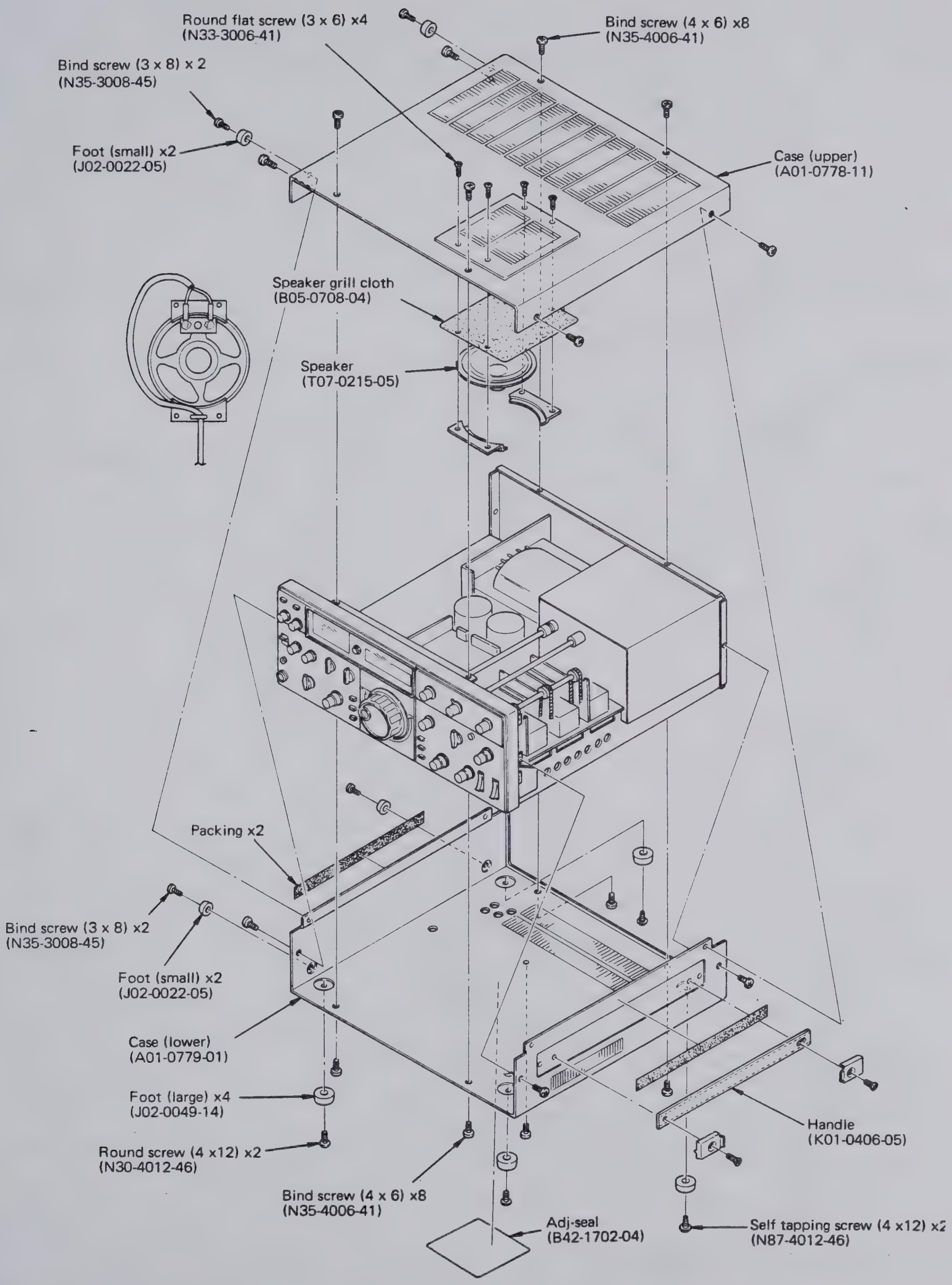
Ref. No.	Parts No.	Description	Re-marks
C113	CC45SL1H101J	C 100pF	
C115	CC45RH1H100D	C 10pF ±0.5pF	
C116	CC45TH1H050C	C 5pF ±0.25pF	
C117	CC45CH1H010C	C 1pF ±0.25pF	
C118	CC45RH1H560J	C 56pF	
C120	CC45CH1H020C	C 2pF ±0.25pF	
C121	CC45SL1H470J	C 47pF	
C123	CC45RH1H390J	C 39pF	
C125	CC45TH1H330J	C 33pF	
C126	CC45TH1H150J	C 15pF	
C127	CC45TH1H330J	C 33pF	
C130	CC45UJ1H150J	C 15pF	
C131	CC45UJ1H050C	C 5pF ±0.25pF	
C132	CC45UJ1H150J	C 15pF	
C139	CC45SL1H100D	C 10pF ±0.5pF	
C140	CC45RH1H220J	C 22pF	
C142	CC45RH1H470J	C 47pF	
C143	CC45RH1H220J	C 22pF	
C144	CC45RH1H470J	C 47pF	
C159	CC45SL1H330J	C 33pF	
C160	CC45SL1H100D	C 10pF ±0.5pF	
C162	CC45CH1H010C	C 1pF ±0.25pF	
C163	CC45SL1H150J	C 15pF	
C166	CC45SL1H100D	C 10pF ±0.5pF	
C167	CC45CH1H020C	C 2pF ±0.25pF	
C169	CC45SL1H101J	C 100pF	
C172	C91-0456-05	C 0.047μF	
C173	CC45CH1H010C	C 1pF ±0.25pF	
C174	CC45UJ1H680J	C 68pF	
C178,179	CC45SL1H220J	C 22pF	
C182,183	C91-0456-05	C 0.047μF	
C184	CC45CH1H270J	C 27pF	
C185	CC45CH1H390J	C 39pF	
C186	CC45CH1H101J	C 100pF	
C187	CC45SL1H221J	C 220pF	
C188	CC45SL1H220J	C 22pF	
C189	CC45SL1H050C	C 5pF ±0.25pF	
C194	CE04W1A470M	E 47μF 10V	
C196	CC45SL1H100D	C 10pF ±0.5pF	
C197~202	C91-0456-05	C 0.047μF	
C205	CE04W1HR47M	E 0.47μF 50V	
TC1	C05-0029-15	Ceramic trimmer 50pF	
TC2,3	C05-0056-05	Ceramic trimmer 30pF	
	E04-0154-05	Coax connector	
	E23-0046-04	Square terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0673-05	Mini connect wafer 6P	
	E40-0973-05	Mini connect wafer 9P	
	E40-1073-05	Mini connect wafer 10P	
L1~7	L40-1511-03	Ferri-inductor 150μH	
L8	L40-4701-03	Ferri-inductor 47μH	
L9	L40-1592-02	Ferri-inductor 1.5μH	
L10	L40-1092-02	Ferri-inductor 1μH	
L11	L40-1292-02	Ferri-inductor 1.2μH	
L12	L40-1892-02	Ferri-inductor 1.8μH	
L13,14	L40-4711-03	Ferri-inductor 470μH	
L15,16	L40-8201-03	Ferri-inductor 82μH	
L17	L40-1511-03	Ferri-inductor 150μH	
L18~20	L40-2701-03	Ferri-inductor 27μH	
L21~24,27~30	L40-1511-03	Ferri-inductor 150μH	

Ref. No.	Parts No.	Description	Re-marks
L31	L40-2211-03	Ferri-inductor 220μH	
L32	L33-0636-05	Choke coil 20μH	
L33~36	L40-1511-03	Ferri-inductor 150μH	
L37	L40-4711-03	Ferri-inductor 470μH	
L38,39	L40-1511-03	Ferri-inductor 150μH	
L40	L40-4711-03	Ferri-inductor 470μH	
L41,42	L40-4701-03	Ferri-inductor 47μH	
L43,44	L40-2211-03	Ferri-inductor 220μH	
L45~49	L40-1511-03	Ferri-inductor 150μH	
T1	L32-0195-05	OSC coil 7, 10 MHz	
T2	L32-0193-05	OSC coil 1.5, 3.5 MHz	
T3	L32-0196-05	OSC coil 14 MHz	
T4	L32-0199-05	OSC coil 18 MHz	
T5	L32-0198-05	OSC coil 28 MHz	
T6	L32-0197-05	OSC coil 21, 24.5 MHz	
T7	L34-0714-05	Tuning coil	
T8	L34-0715-05	Tuning coil	
T9	L34-0716-05	Tuning coil	
T10	L34-0717-05	Tuning coil	
T11	L34-0718-05	Tuning coil	
T12	L34-0757-05	Tuning coil	
T13	L34-0711-05	Tuning coil	
T14	L34-0713-15	Tuning coil	
T15	L34-0712-05	Tuning coil	
T16	L32-0201-05	OSC coil 8.83 MHz	
T17	L34-0709-05	Tuning coil 10 MHz	
T18	L34-0710-05	Tuning coil 20 MHz	
X1	L77-0482-05	Crystal 10 MHz	
X2	L77-0486-05	Crystal 8.8285 MHz	
X3	L77-0485-05	Crystal 8.8315 MHz	
VR1	R12-5030-05	Trim. pot 100kΩ	
VR2,3	R12-1040-05	Trim. pot 4.7kΩ	
	R92-0150-05	Short jumper	

COUNTER UNIT (X54-1540-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0456-05	C 0.047μF	
C3	C91-0457-05	C 0.022μF	
C4	CC45SL1H150J	C 15pF	
C6	CE04W1A470Q	E 47μF 10V	
C7	CE04W1A101Q	E 100μF 10V	
C8,9	C91-0456-05	C 0.047μF	
C11	CE04W1C101M	E 100μF 16V	
C12	CE04W1V100Q	E 10μF 35V	
C13	CQ92M1H103K	ML 0.01μF 50V	
C14~16	CE04W1V100Q	E 10μF 35V	
C17,18	C91-0456-05	C 0.047μF	
C19	CQ92M1H103K	ML 0.01μF 50V	
C21,22	CC45SL1H050C	C 5pF ±0.25pF	
C23	CE04W1A330Q	E 33μF 10V	
C24~26	C91-0456-05	C 0.047μF	
C28	CE04W1H100M	E 10μF 50V	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-4711-03	Ferri-inductor 470μH	
L2	L40-1011-04	Ferri-inductor 100μH	
L3	L40-2211-03	Ferri-inductor 220μH	
L4	L40-1511-03	Ferri-inductor 150μH	

DISASSEMBLY



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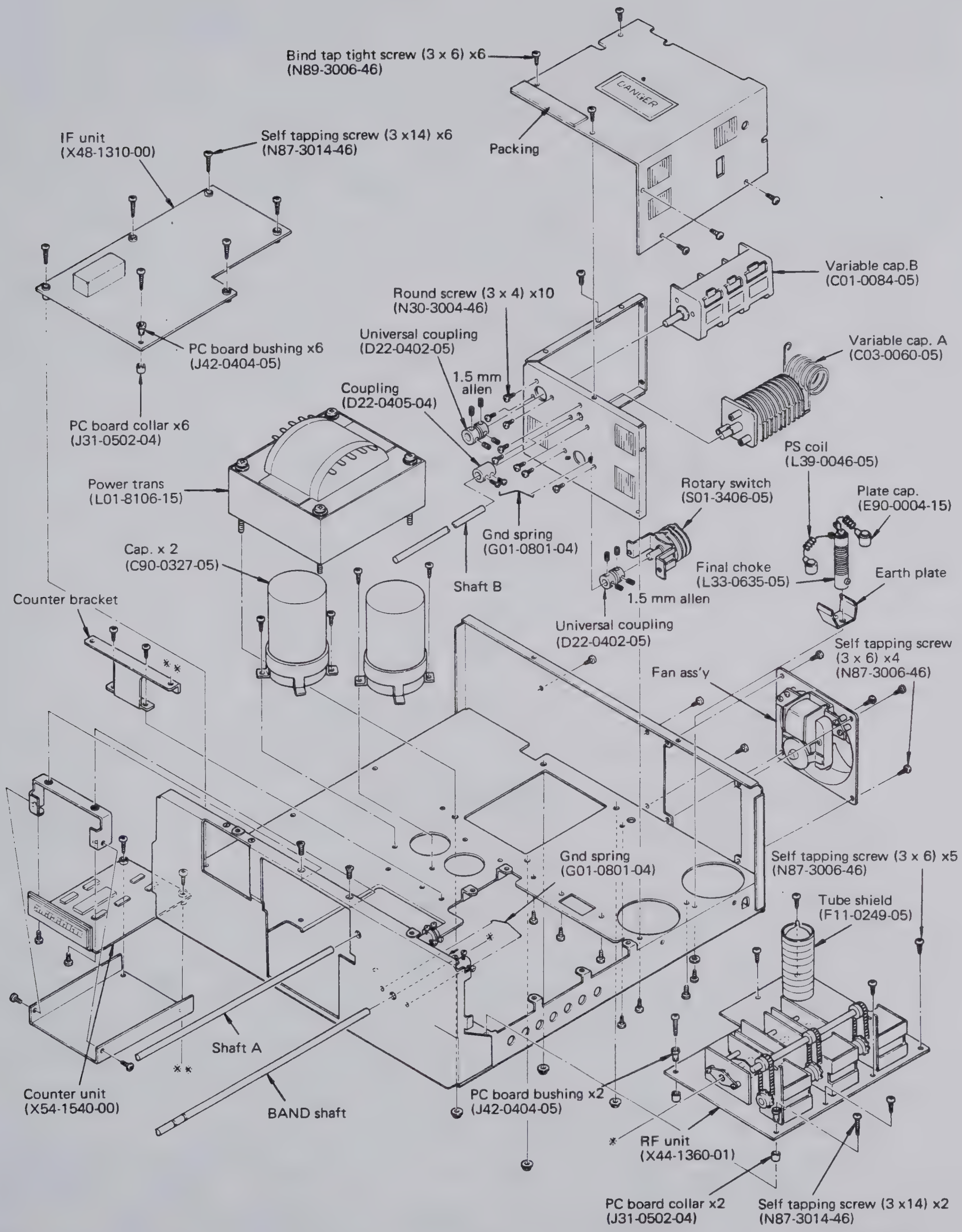

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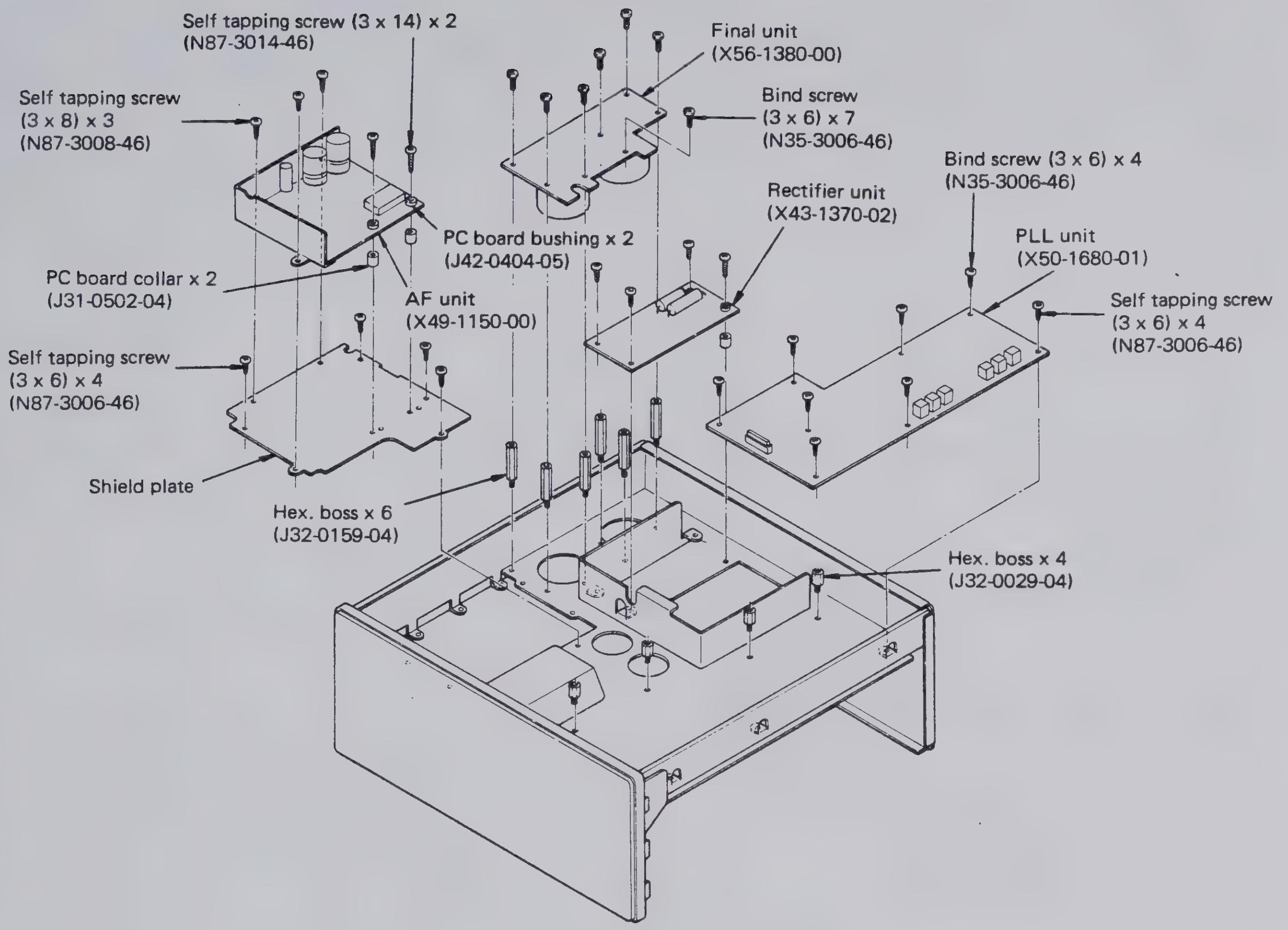
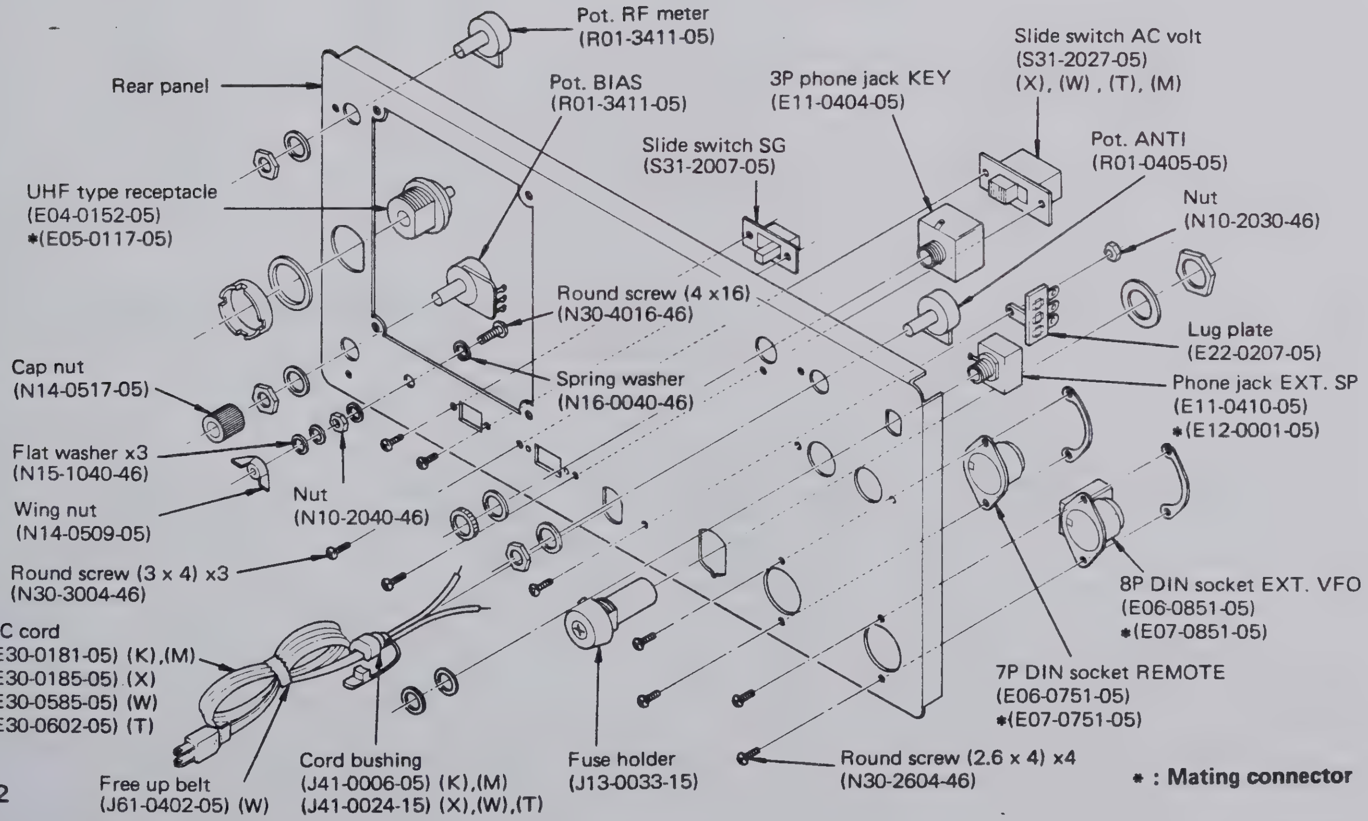


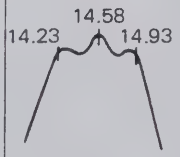


*** : Mating connector**

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. 9V AVR and 3.2V adjustment		DVM	AF	TP-6 Pin-5, connector ⑪	AF	VR2 VR3	9V 3.2V	9V±0.05V 3.2V±0.05V	 RF1 (FET bias)
2. Base current adjustment	SG SW : ON MODE: USB METER : IP HEATER : ON DRIVE :Fully clockwise STBY : SEND BIAS pot. : Adjust	1P meter			Rear panel	Bias pot.		Set to 60mA	
	STBY REC, SG SW OFF								
3. Carrier adjustment①	IF SHIFT : Centered MODE : USB	RF VTVM	IF	Pin1, connector ⑧	PLL	NOTE : T16	0.3V	0.3V±1 dB	NOTE : The slug of T16 should be turned counter clockwise for this adjustment after the peak point is determined.
	MODE : LSB STBY : REC ↕ SEND	F. counter				VR2	Obtain the same frequency for both transmission and reception	±20 Hz	
	STBY : REC					TC2	8828.50 kHz		
	MODE : USB					TC3	8831.50 kHz		
	MODE : CW STBY : SEND					VR3	8830.70 kHz		
	STBY : REC								
4. IF SHIFT check	MODE : LSB Rotate the IF SHIFT and check the variation	F. counter	IF	Pin 1, connector ⑧				Set IF SHIFT to center. More than + 1.1 kHz , Less than −1.1 kHz.	
	MODE : USB Same as above								
	STBY : SEND Regardless of the IF SHIFT setting							8831.50 kHz	USB
								8828.50 kHz	LSB
	STBY : REC								
5. VFO, RIT check and adjustment	Scale 0~500							Should rotate smoothly and have no abnormal noise.	
	Rear panel SG SW OFF	RF VTVM	PLL	Pin 1, connector ⑥ 2P(GND)	Adjust if the voltage is out of specification.			200 mV±1 dB	
	VFO : 250				VFO	TC2	200mV		
	MODE : CW STBY : SEND	F. counter	Rear panel	EXT VFO 1P, 7P (GND)		Adjust if the frequency is out of specification.	800 Hz UP	800±50 Hz	CW SHIFT

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	RIT OFF								
6. Reference oscillator adjustment		F. counter	PLL	TP2	PLL	TC1	1000.000 kHz		
7. VCO adjustment and check	Check the frequencies at the following points and adjust coils until those given in brackets are obtained.	F. counter DVM	PLL PLL	D40 TP1					
	Check the level at each of the above points.	RF VTVM	RF	TP3				$1\text{V}\,^{+3}_{-2}\ \text{dB}$	
PLL lock range	Both edges of the VFO frequency in each band.							Display should indicate.	
8. BPF-A	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D24 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the sweep generator RF output to the EXT-VFO connector.	Sweep generator Oscillo-scope	PLL	Q35 Ⓔ	PLL	T13 T14 T15	Adjust until the response shown to the right is obtained.		

BAND \ VFO	0	250	500	Adjusting point	
				Unit	Part
1.5	10.33 MHz	10.58 MHz (4.0V)	10.83 MHz	PLL	T2
3.5	12.33	12.58	12.83		
7	15.83	16.08 (4.75V)	16.33		T1
10	18.83	19.08	19.33		
14	22.83	23.08 (4.5V)	23.33		T3
18	26.83	27.08 (5.0V)	27.33		T4
21	29.83	30.08 (3.5V)	30.33		T6
24.5	33.33	33.58	33.83		
28	36.83	37.08	37.33		T5
28.5	37.33	37.58	37.83 (4.75V)		
29	37.83	38.08	38.33		
29.5	38.33	38.58	38.83		

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
13. Coil pack adjustment	Connect the SSG (40dB) to the ANT terminal DRIVE : 12:00 While adjusting, gradually decrease the SSG output level down to −6 dB. Adjust at the following points:	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil RF coil	Max. audio output		

No.	BAND	VFO	f	Parts
1	1.5	400	1.9 MHz	1.8
2	3.5	250	3.75	3.5
3	7	150	7.15	7
4	10	125	10.125	10
5	14	175	14.175	14
6	18	125	18.125	18
7	21	225	21.225	21
8	24.5	450	24.950	24.5
9	28.5	300	28.800	28

Item	Condition	Test equipment	Unit	Terminal	Unit	Parts	Method	Specification	Remarks
14. Drive coil adjustment	CAL : ON CAR VR : optinum level METER : ALC HEATER : ON MODE : CW SG SW : OFF ANT : 50Ω dummy should be connected. Connect pin 2 to pin 4, connector ⑦ on the AF unit with a clip lead. Receive the marker frequency in the following bands and obtain the peak level by adjusting the DRIVE control. Set the STBY switch to SEND and adjust each drive coil.	50Ω dummy			RF	DRIVE coil	Max. ALC meter reading		NOTE: The 50Ω dummy should be connected to the ANT terminal. Otherwise drive tuming will be incorrect.

BAND	VFO	Parts
1.5	400	1.8
3.5	250	3.5
7	150	7
(10)	(125)	10
14	175	14
(18)	(125)	18
21	225	21
(24.5)	(450)	24.5
28.5	300	28

STBY : REC

(　) : See note **BEFORE** adjustment

Note :

TRANSMITTING ON WARC BANDS

As supplied, the TS-530S will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required.

1. For all 3 bands : Break the line between the RF unit X44-1360-01, connector #6, Pin #1 (TOF terminal) and AF unit X49-1150-00, connector #7, Pin #4 (TOF terminal).
2. Or, for individual Bands : On the RF unit X44-1360-01 :

Band	Remove (or Cut) Part
10 MHz	D4
18 MHz	D5
24.5 MHz	D6

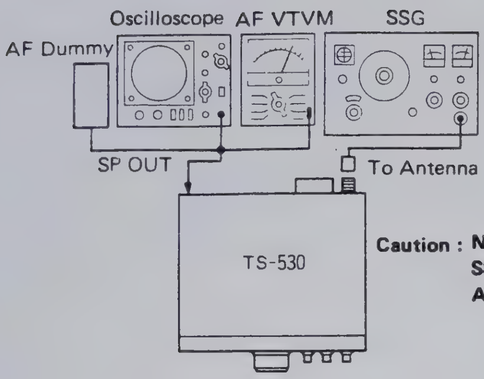
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
NB adjustment	AGC : FAST Disconnect the SSG output from the ANT terminal, and connect the noise generator output in it's place. Set the noise generator output level to S5~7.	Speaker	Rear panel	EXT. SP					
	NB : ON							The NB must provide adequate effect.	
					If adequate effect is not obtained, repeat the adjustment several times.				
	Reduce the noise generator output level to below the threshold of sensitivity. Turn the NB LEVEL control fully clockwise.							Noise must be blanked.	
	NB : OFF								
19. Neutralization trimmer adjustment	BAND : 28, +0.5 SHIFT : ON VFO :300 SG SW : ON STBY : SEND Tune the DRIVE, PLATE and LOAD	Power meter Sync'ed scope	Rear panel	ANT					Tune-up for MAX RF output.
	SG SW : OFF							RF output must be 0.	
	METER : ALC Set the ALC to maximum with the DRIVE control. Increase oscilloscope sensitivity.					Neutralization trimmer TC1	Minimum		
	Reduce oscilloscope sensitivity (5V/div.). SG SW : ON							The normal power must be obtained. The signal waveform must be normal.	
20. Side tone, semi-break-in function adjustment	Connect a power meter to the ANT terminal. Plug key into the rear Key jack to transmit in any band.	Oscilloscope AF VTVM	Rear panel	EXT. SP	AF	VR1	0.63V/8Ω		
	Operate the key.							The key must control RF output.	
	STBY : REC VOX : ON Operate the key							Semi-break-in operation should be available.	

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	AG : 300Hz ↕ 2700Hz				PLL	TC3	Adjust until the same level is obtained for both 300Hz and 2700Hz (equal audio rolloff).		
	MODE : LSB same as above					TC2			
	AG : 400Hz AG : 2600Hz							More than 1/2 with respect to the 1500Hz signal level observed on the scope.	
	After completing the above adjustment, readjust carrier suppression (see item 23.)				IF	VR4 TC1	Minimum	Less than –50dB	
	STBY : REC								
25. Speech processor adjustment	SG SW : OFF MODE : USB PROC : OFF METER : ALC Connect the AG (1500 Hz, 10mV) to the MIC input connector. STBY : SEND Adjust the MIC gain control until the meter indicates the maximum on-scale ALC reading.								
	PROC : ON				IF	VR3	Adjust until the same meter reading is obtained (max on-scale ALC).		
	STBY :REC PROC : OFF								

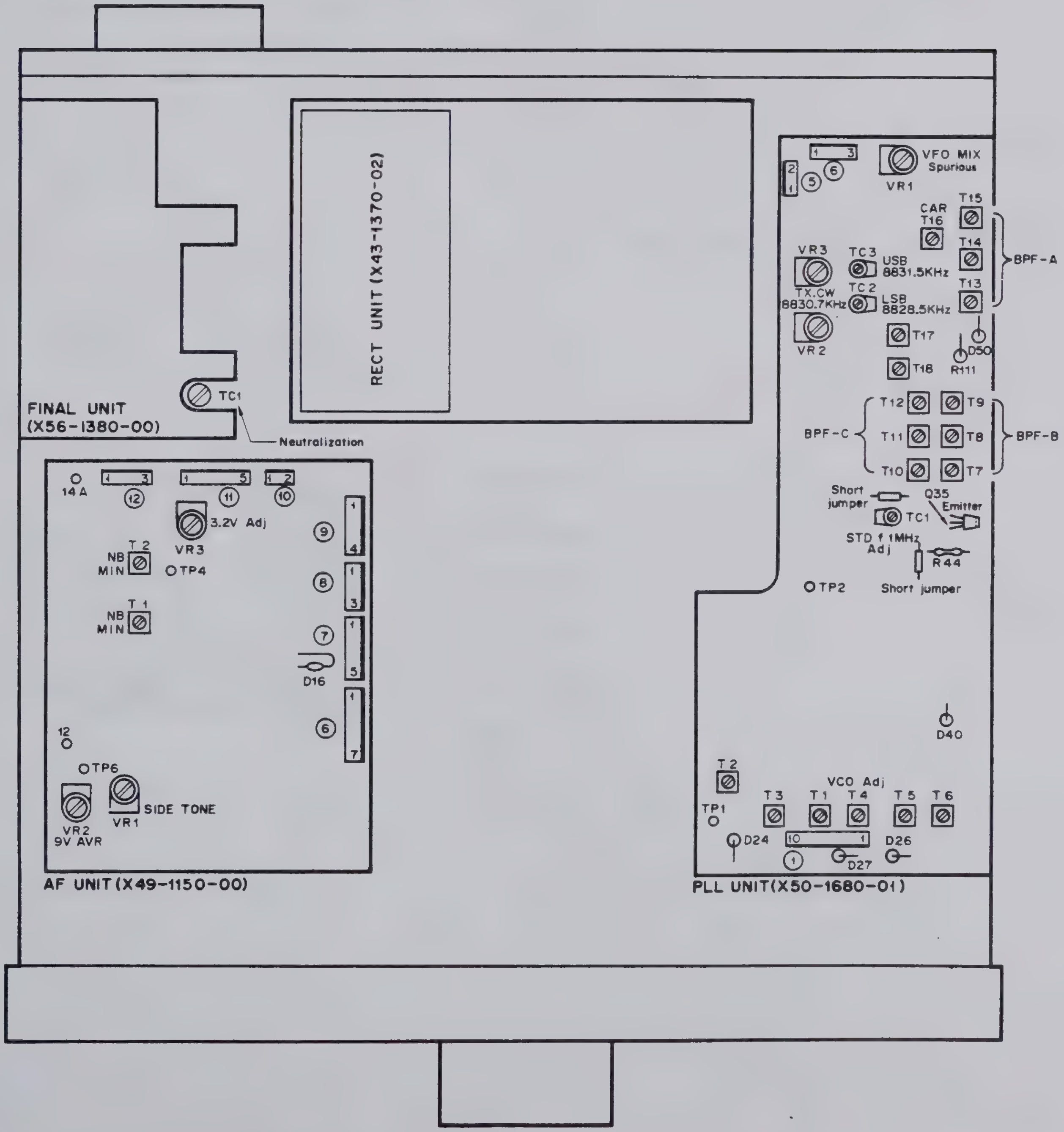
ADJUSTMENTS



Caution : **Never transmit when SSG is connected to the ANT terminal.**

Fig. 12 (12) IF AMP, (13) COIL PACK, (15) IF TRAP

▼ BOTTOM VIEW



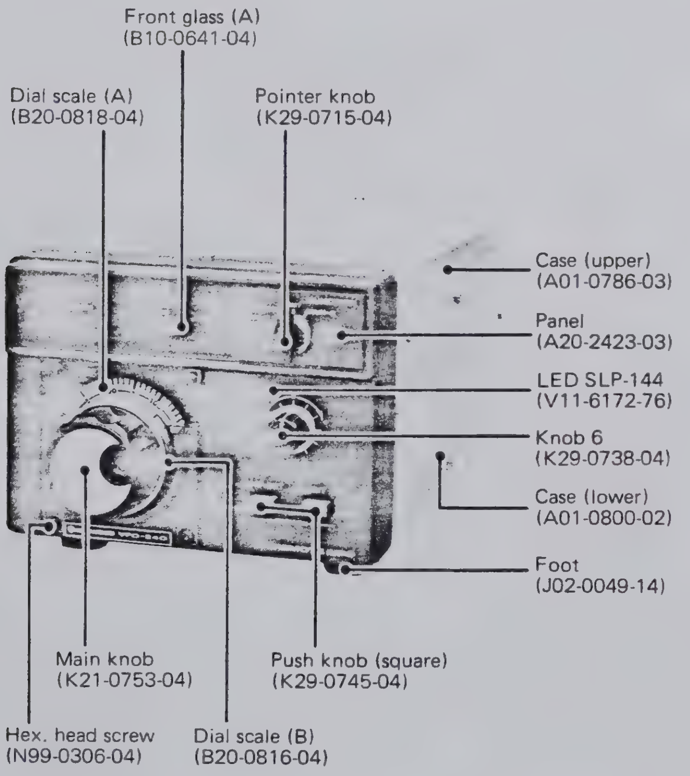
VFO-240

SPECIFICATIONS

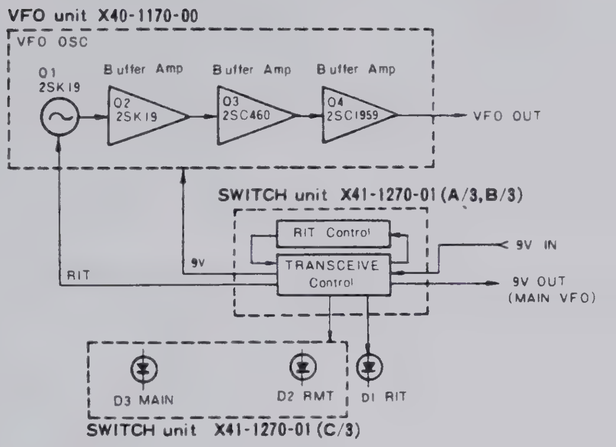
Oscillator frequency	5.50～6.00 MHz
Oscillator circuit	Clapp
Output voltage	0.2V ±1dB (across 470 ohm load)
Frequency stability	Within 100 Hz per 30 minutes after 3 minutes warm-up (at room temperature)
Solid-state complement	FET: 2 Transistor: 2 Diode: 6
Power source	From TS-530S or TS-830S
Dimensions	180 (7-1/8") W × 133 (5-1/4") H × 288 (11-5/16") D mm (inch)
Weight	2.9 kg (6.4 lbs)

* Specifications are subject to change for improvement without notice.

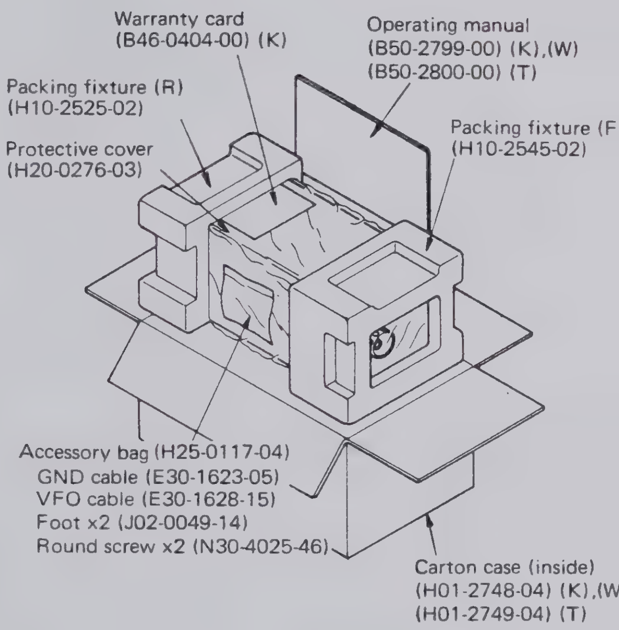
OUTSIDE VIEW



BLOCK DIAGRAM



PACKING



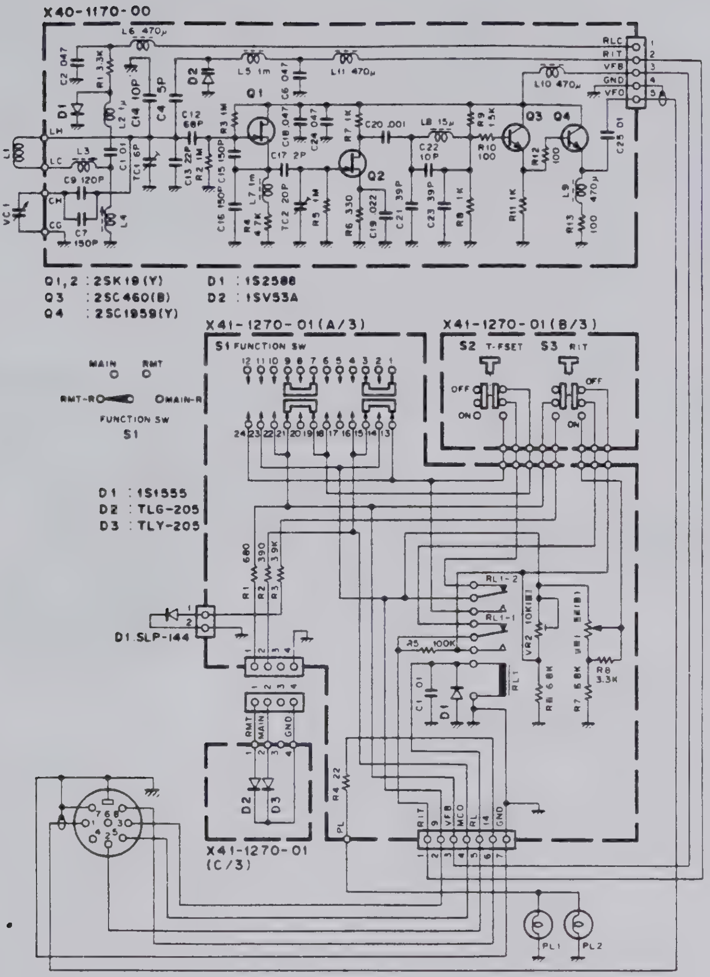
PARTS LIST

☆: New par

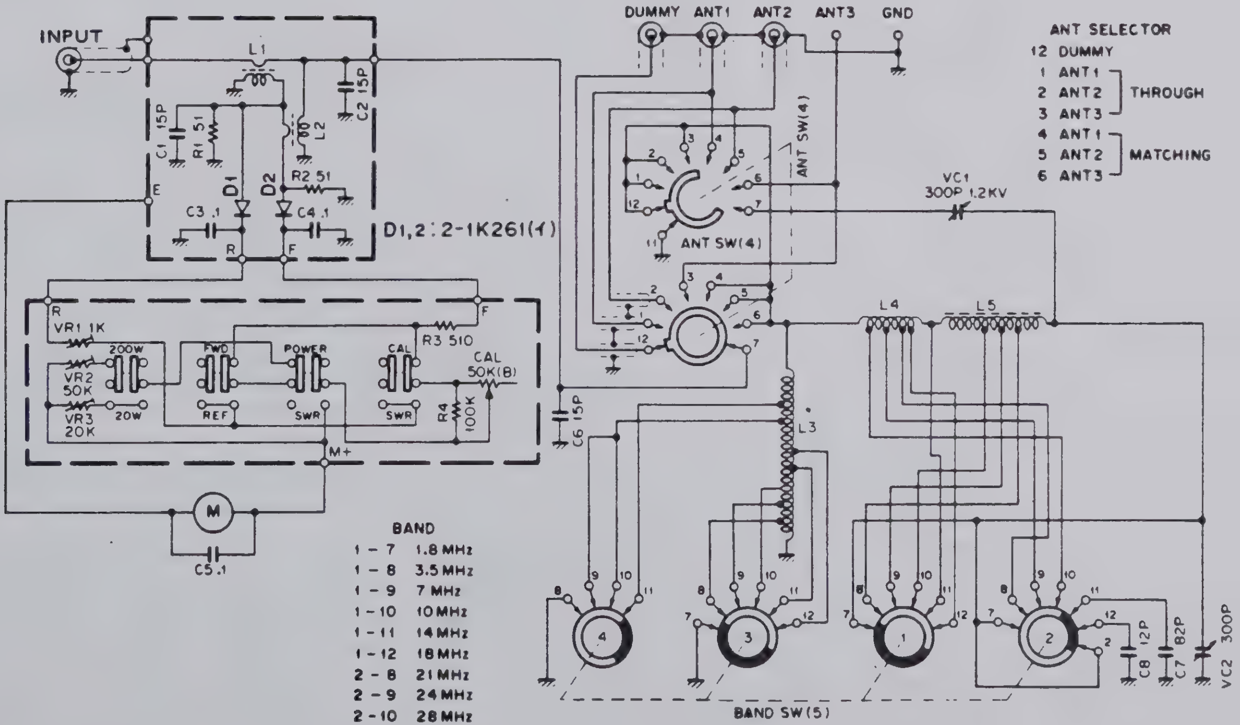
Ref. No.	Parts No.	Description		Re-mark
VFO-240 GENERAL				
	A01-0786-03	Case (upper)		
	A01-0800-02	Case (lower)		☆
	A20-2423-03	Panel		☆
	B10-0641-04	Front glass (A)		☆
	B43-0658-04	Name plate	T	☆
	B43-0659-04	Name plate	K,W	☆
	B46-0404-00	Warranty card	K	
	B50-2799-00	Operating manual	K,W	☆
	B50-2800-00	Operating manual	T	☆

VFO-240/AT-230

VFO-240
SCHEMATIC DIAGRAM

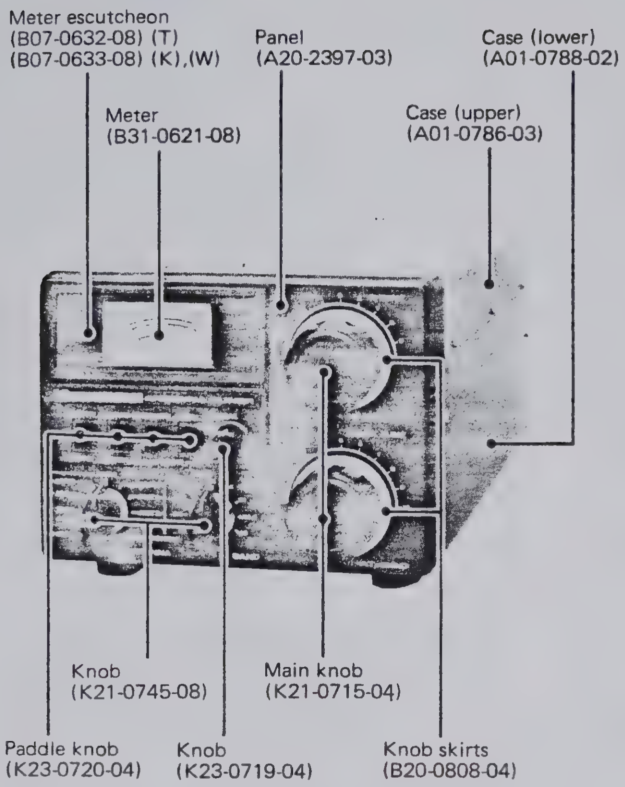


AT-230
SCHEMATIC DIAGRAM



AT-230

OUTSIDE VIEW



ADJUSTMENTS

1. INSTRUMENTS

1) Terminated Power Meter

1. Frequency range: 50 MHz or more
2. Input impedance: 50Ω
3. Power range: 20W and 200W

2) HF Transmitter or Transceiver

1) Output: 100W CW
Variable to 10W.
Example: TS-530, TS-830S

2. POWER METER ADJUSTMENT

1) Test Equipment Connection

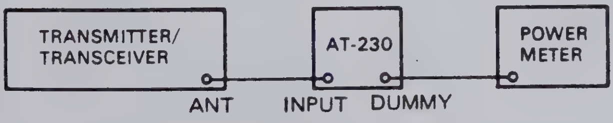


Fig. 1

2) Adjustment

1. Connect as in Fig. 1.
2. Unless otherwise specified, controls should be set as follows:

ANT SW	DUMMY
BAND SW	14
200W/20W SW	200W
FWD/REF SW	FWD
POWER/SWR SW	POWER
CAL/SWR SW	SWR

Tune up the transceiver at 14.175 MHz

3. Adjust the transceiver for 100W output at the power meter (adjusted by the carrier level control)
Adjust VR2 on the switch unit for a meter reading of 100 on the AT-230

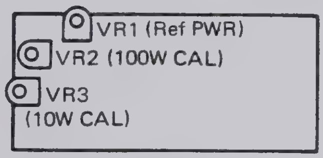


Fig. 2

4. As in step 3, lower transceiver output to 10W and adjust VR3 for a meter indication of 10 on the 20W scale

3. CALIBRATION OF REF POWER

1) Connection

As in Fig. 1.

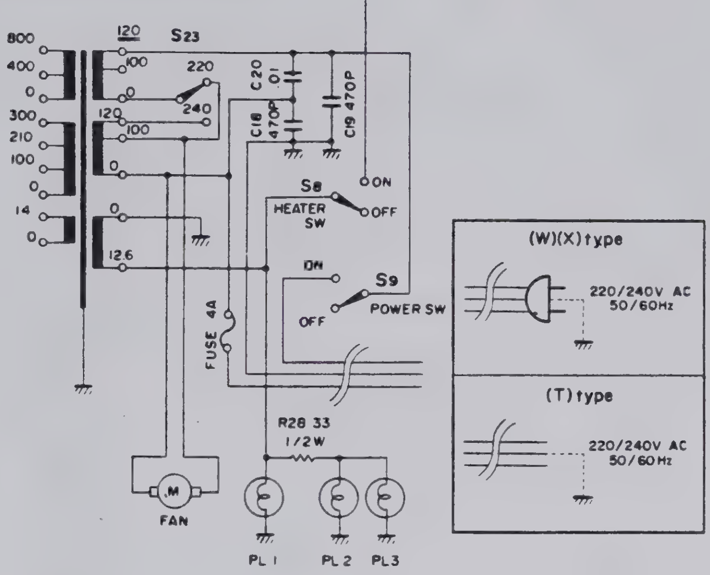
2) Adjustment

1. Set controls as described in 2.2
Confirm 100W CW output reading.
2. Unkey the transceiver and reverse the coaxial cable between the INPUT and DUMMY terminals on the AT-230. Move the FWD/REF switch to the REF position
3. Transmit and adjust VR1 for previously confirmed 100W reading

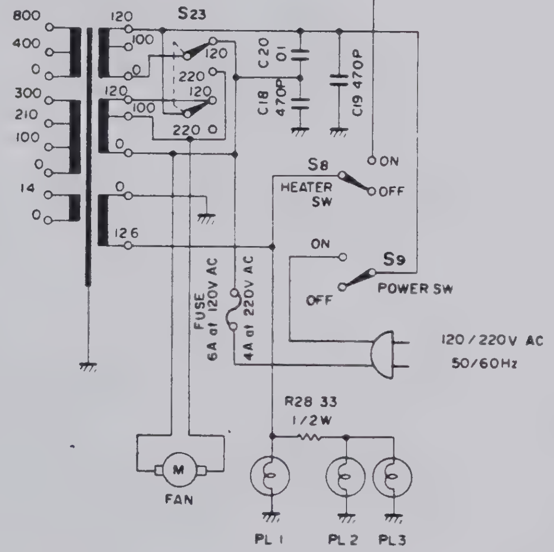
SCHEMATIC ABBREVIATION

Connector No.	Terminal name	
⑧	RLT	+9V on transmit
	RLR	+9V on receive
	−6	B −6V
⑨	ALC	ALC output from Q31
	RLT	+9V when transmit
	RLR	+9V when receive
	RL	Relay voltage
⑩	RAL	External ALC input remote socket
	VR2	Arm of TX bias control
⑪	NBV	Top of noise blanker VR
	NBS	Noise blanker SW
	9	B +9V
	PRS	Processor SW
	RF1	Top of RF gain control
⑫	NSG	Noise blanker gate signal
	RB2	Receiver bias for IF unit
	14A	14V input
	G14	14V input (ground)
	FG	Bias for control grid of 6146B
Final unit (X56-1380-00)		
	DRV	Drive input
	FG	Control grid bias
	H	Heater voltage AC12.3V
	IPM	IP meter voltage
	SG	Screen grid voltage
Rectifier unit (X43-1370-02)		
	800	B +800V
	HV	High voltage signal to METER
	300B	B +300V
	210B	B +210V
	210A	B +210V
	−C	Common B− approx. −100V
	12	Screen grid cut off voltage
	SG2	Screen grid voltage
	TUN	Screen grid voltege for TUN

TS-530S (T)(W)(X)Type



TS-530S (M)Type



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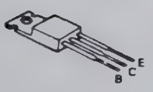

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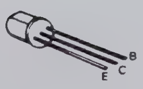

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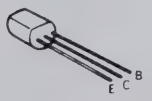
2SA1015 2SC1815
2SC945 2SC1923
2SC1515 2SC1959
2SC1675 2SC2240



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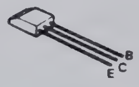

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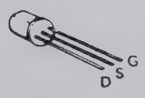

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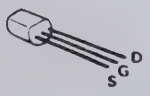
2SK30A



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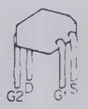

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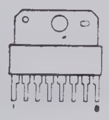

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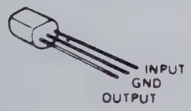

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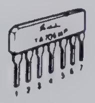
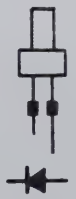
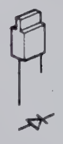


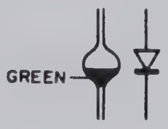
SLP-144



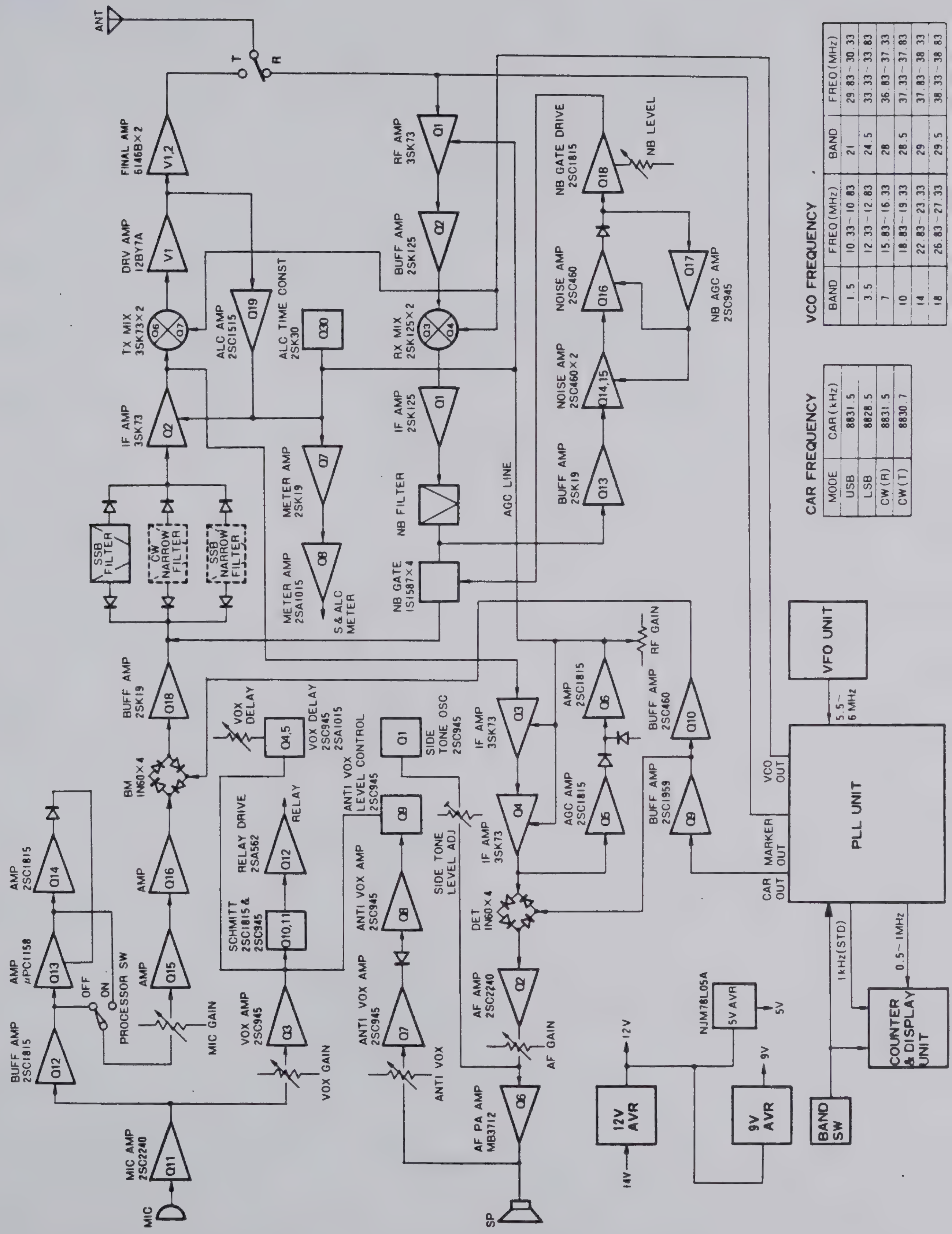
TLR-205



MV-13



BLOCK DIAGRAM



CAR FREQUENCY

MODE	CAR (kHz)
USB	8831.5
LSB	8828.5
CW (R)	8831.5
CW (T)	8830.7

VCO FREQUENCY

BAND	FREQ (MHz)	BAND	FREQ (MHz)
1.5	10.33~10.83	21	29.83~30.33
3.5	12.33~12.83	24.5	33.33~33.83
7	15.83~16.33	28	36.83~37.33
10	18.83~19.33	28.5	37.33~37.83
14	22.83~23.33	29	37.83~38.33
18	26.83~27.33	29.5	38.33~38.83

SPECIFICATIONS

GENERAL

Frequency Range	160 m Band	1.8~2.0 MHz
	80 m Band	3.5~4.0 MHz
	40 m Band	7.0~7.3 MHz
	* 30 m Band	10.1~10.15 MHz (10.0 MHz WWV)
	20 m Band	14.0~14.35 MHz
	* 17 m Band	18.068~18.168 MHz
	15 m Band	21.0~21.45 MHz
	* 12 m Band	24.89~24.99 MHz
	10 m Band	28.0~29.7 MHz

(K) : USA
(T) : Britain
(W) : Europe
(X) : Australia
(M) : General market

Modes	SSB/CW
Frequency Stability	Within 1 kHz during the first hour after 1 minute of warmup. Within 100 Hz during any 30 minute period after warmup.
Power Requirement	120V AC (220,240V modifiable) 50/60 Hz : (K) 120/220V AC (Selectable) 50/60 Hz : (M) 220/240V AC (Selectable) 50/60 Hz : (T)(W)(X)
Power Consumption	Transmit : 295 watts Receive : 27 watts (with heaters off)
Dimensions	333 (13.3) x 133 (5.3) x 333 (13.3) mm (inch)
Weight	12.8 kg (28.2 lbs)

TRANSMITTER

* Final Power Input	220W PEP for SSB operation 180W DC for CW operation
Audio Input Impedance	500Ω~50kΩ
RF Output Impedance	50Ω~75Ω
Carrier Suppression	Better than 40 dB
Sideband Suppression	Better than 50 dB
Spurious Radiation	Better than 60 dB
Harmonic Radiation	Better than 40 dB
Audio Freq. Response	400 to 2,600 Hz within –6 dB

RECEIVER

Receiver Sensitivity	0.25μV at 10 dB S + N/N
Image Ratio	Better than 60 dB
IF Rejection	Better than 70 dB
Receiver Selectivity	
SSB/CW	2.4 kHz (–6 dB), 4.2 kHz (–60 dB) CW Optional Filter YK-88C 500 Hz (–6 dB), 1.5 kHz (–60 dB) YK-88CN 270 Hz (–6 dB), 1.1 kHz (–60 dB) SSB Optional Filter YK-88SN 1.8 kHz (–6 dB), 3.3 kHz (–60 dB)
Audio Output Impedance	8~16Ω
Audio Output	1.5 W (8Ω)

* Will transmit on the new 30, 17, and 12 meter bands.
Diodes installed for preventing accidental transmission before government Amateur authorization.

NOTE : The circuit and ratings may change without notice due to developments in technology.

CIRCUIT DESCRIPTION

This is mixed with the VCO output for each band by MIX (1) to a frequency given in **Table 4**, which is then routed through LPF (1), amplified, and wave-shaped to a digital signal. A programmable divider divides this signal into a 500 kHz output. This programmable divider is preset, as shown in **Table 4**, by the BCD signal which is counter-generated from information coming from the band switch. The phase comparator used is a Motorola MC4044P. The loop filter is made of completely discrete components to minimize VCO spurious content.

Six VCOs cover all bands. If the PLL unlocks for any reason, it will be detected from the phase comparator output. This will turn off the VCO output to prevent spurious radiation and, at the same time, the display will be blanked to inform the operator of unlock status.

BAND	RX. Tx frequency (MHz)	VCO (MHz)	MIX (1) input (MHz)	MIX (1) output (MHz)	Division ratio	DCBA
1.5	1.5 ~2.0	10.33 ~10.83	14.33 ~14.83	4.0	1/8	1 0 0 0
3.5	3.5 ~4.0	12.33 ~12.83	14.33 ~14.83	2.0	1/4	1 1 0 0
7	7.0 ~7.5	15.83 ~16.33	14.33 ~14.83	1.5	1/3	1 1 0 1
10	10.0 ~10.5	18.83 ~19.33	14.33 ~14.83	4.5	1/9	0 1 1 1
14	14.0 ~14.5	22.83 ~23.33	24.33 ~24.83	1.5	1/3	1 1 0 1
18	18.0 ~18.5	26.83 ~27.33	24.33 ~24.83	2.5	1/5	1 0 1 1
21	21.0 ~21.5	29.83 ~30.33	34.33 ~34.83	4.5	1/9	0 1 1 1
24.5	24.5 ~25.0	33.33 ~33.83	34.33 ~34.83	1.0	1/2	1 1 1 0
28	28.0 ~28.5	36.83 ~37.33	〃	2.5	1/5	1 0 1 1
28.5	28.5 ~29.0	37.33 ~37.83	〃	3.0	1/6	1 0 1 0
29	29.0 ~29.5	37.83 ~38.33	〃	3.5	1/7	1 0 0 1
29.5	29.5 ~30.0	38.33 ~38.83	〃	4.0	1/8	1 0 0 0

Table 3 Frequency chart

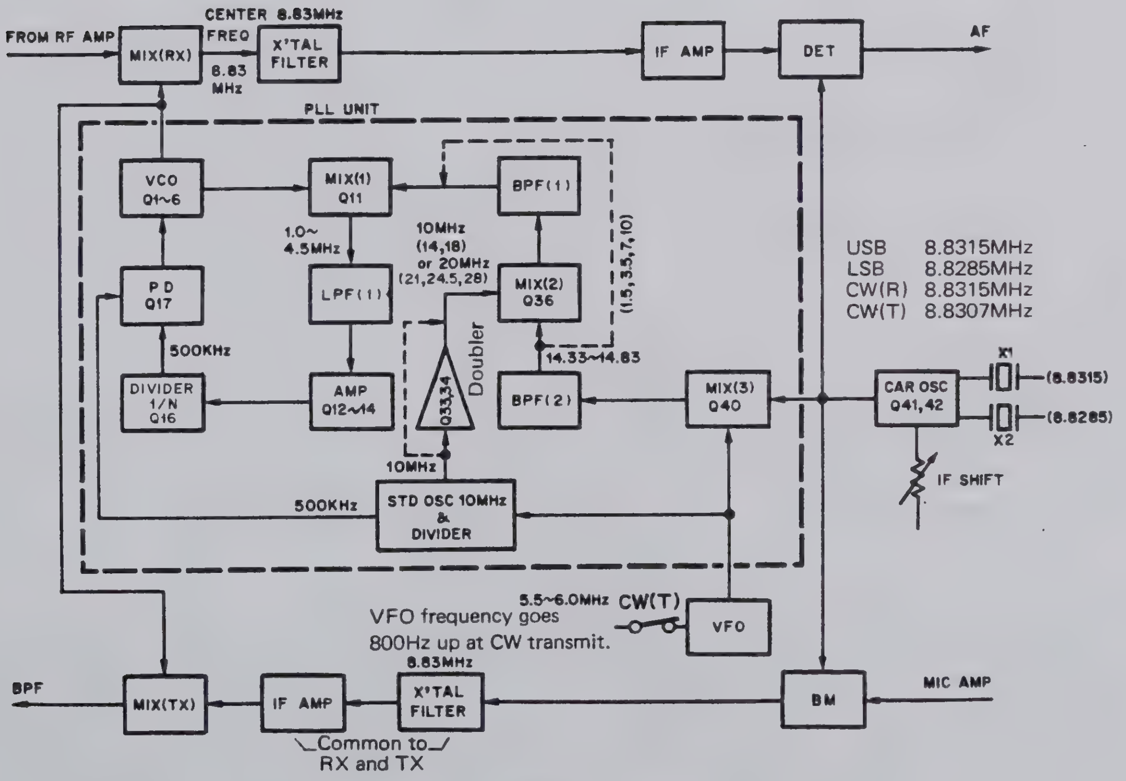


Fig. 1 TS-530 Frequency configuration

CIRCUIT DESCRIPTION

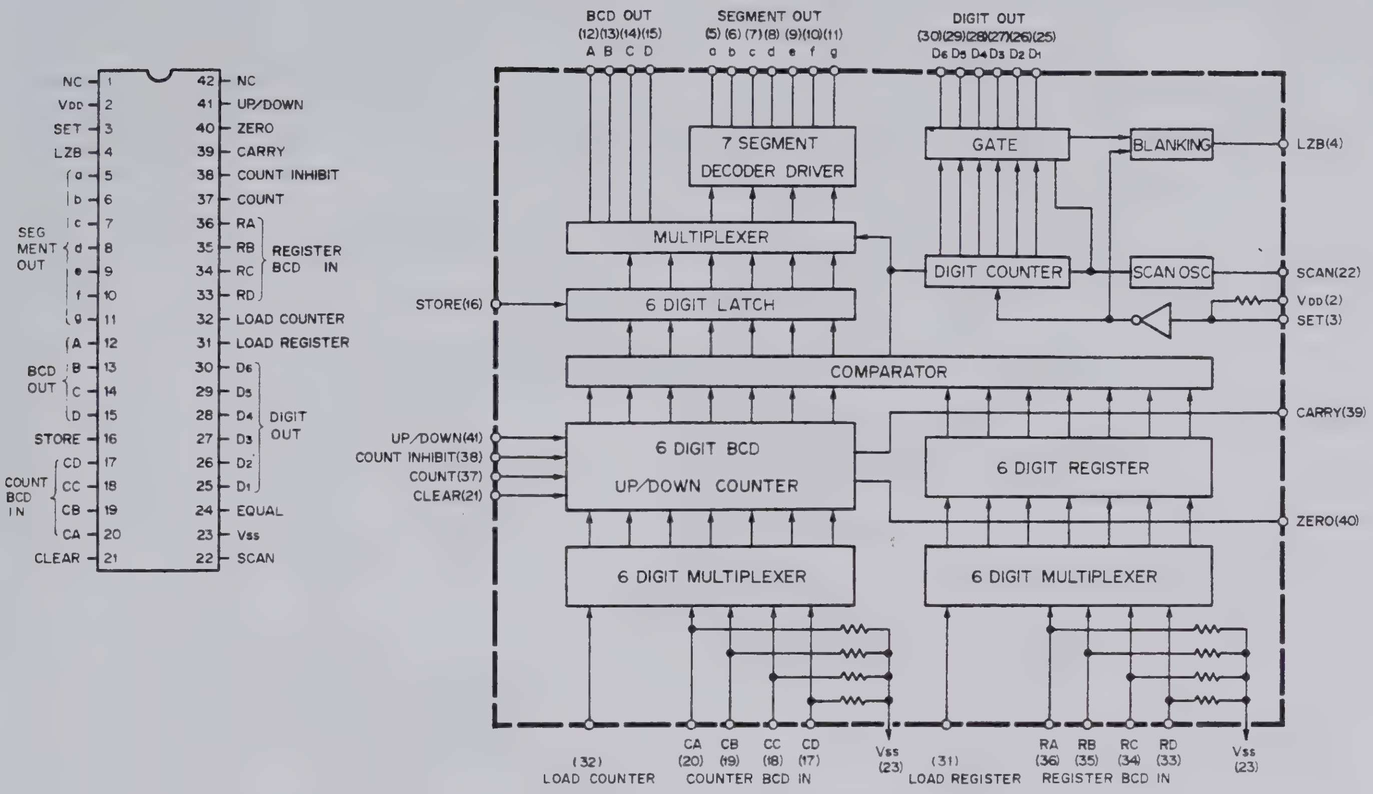


Fig. 4 TS5070P (Counter unit, Q5)

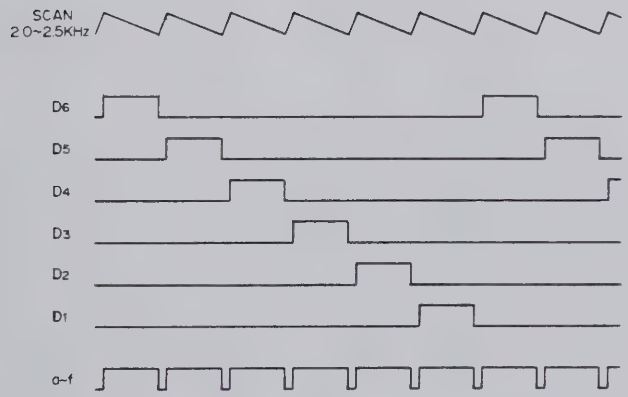
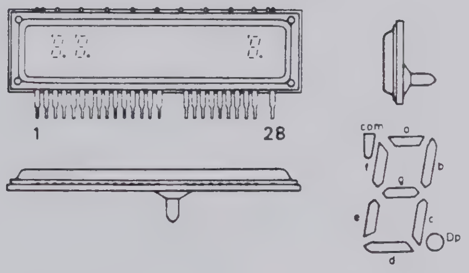


Fig. 5 TC5070P Timing chart



PIN NO	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CONNECTION	F	N_C	G_9	N_C	N_C	G_8	g	f	G_7	e	d	G_6	N_C	N_C
	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	G_5	N_P	N_P	G_4	D_P	G_3	c	b	G_2	a	COM	G_1	N_P	F

Fig. 6 Indicating tube 9-BT-12

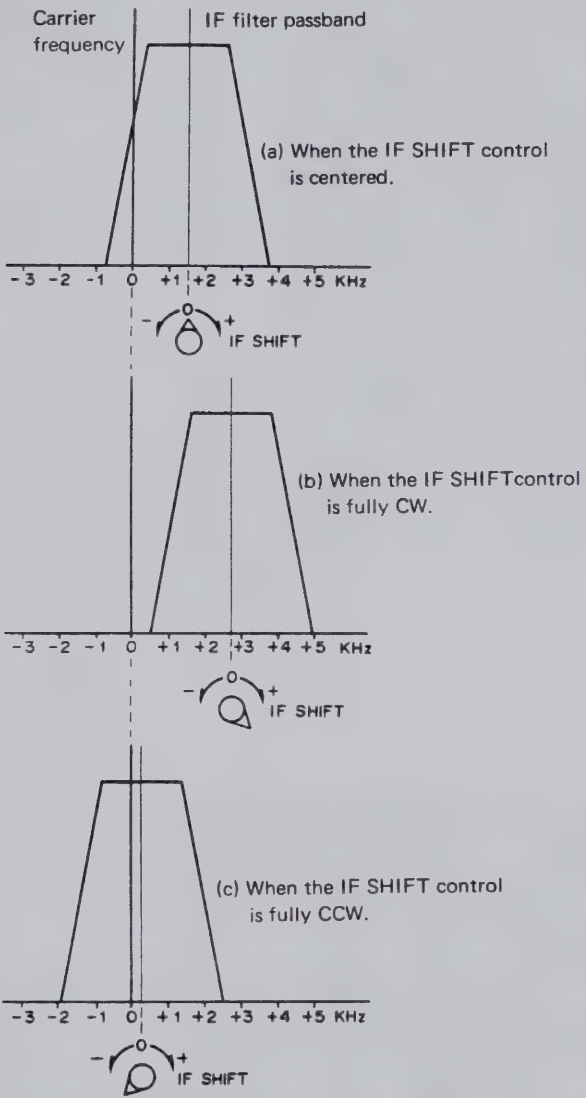
Q5 (TC5070P) is a presettable, 6-digit BCD counter which incorporates a 6-digit latch, 6-digit dynamic drive digital counter, and 7-segment decoder/driver. Band information supplied from the RF unit is applied to a diode matrix to preset the 100 kHz, 1 MHz and 10 MHz digits. Preset values are given in **Fig. 3**. For instance, to preset 14.000 MHz, with a 500 kHz counter input signal, the 10 MHz value is preset to 1, 1 MHz to 3, and 100 kHz to 5, and the 500 kHz counter input signal is subtracted from 14.000 MHz. (If no counter input signal were present, 13.500 MHz would be displayed). Q5 supplies the display tube drivers with 7-segment information and dynamic drive control signals to light the fluorescent display tube.

In the counter unit, a diode matrix generates frequency division information and supplies the PLL unit with this information. If the PLL unlocks, a BLK (Blanking Low) signal will be applied to the digit driver IC (Q11) to blank the fluorescent display tube.

CIRCUIT DESCRIPTION

2. IF SHIFT operation

The IF SHIFT circuit shifts the passband of the IF circuit without changing the receiving frequency. The relative position of the passband of the IF filter to the received signal is shifted when the IF SHIFT control is turned as shown in **Fig. 7**. The IF SHIFT circuit block diagram is shown in **Fig. 8**.



(a) When the IF SHIFT control is centered.

(b) When the IF SHIFTcontrol is fully CW.

(c) When the IF SHIFT control is fully CCW.

Fig. 7 IF SHIFT operation (for USB mode)

Frequencies within the PLL loop satisfy the following relationship.

$$N \cdot 500\,\text{kHz} = f_{BPF1} - f_{VCO} \qquad (1)$$

where N : divisor of programmable divider
500 kHz : phase reference frequency
f_{BPF1} : input frequency to MIX (1)
f_{VCO} : VCO frequency

For example, in the case of 14 MHz reception, f_{BPF1} is given by eq. (1) as

$$f_{BPF1} = 10\,\text{MHz} + f_{BPF2} \qquad (2)$$

where 10 MHz : band setting frequency

$$f_{BPF2} = f_{VFO} + f_{CAR} \qquad (3)$$

where f_{VFO} : VFO frequency
f_{CAR} : carrier frequency

By substituting eq. (3) into eq.(2) and eq.(2) into eq.(1)

$$f_{VCO} = 10\,\text{MHz} + f_{VFO} + f_{CAR} - N \cdot 500\,\text{kHz}$$

$$\therefore f_{CAR} = f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})$$

Assuming that f_{VFO} is constant, when f_{CAR} is varied by $\pm \Delta f$,

$$\begin{aligned} f_{CAR} \pm \Delta f &= [f_{VCO} + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO})] \pm \Delta f \\ &= (f_{VCO} \pm \Delta f) + (N \cdot 500\,\text{kHz} - 10\,\text{MHz} - f_{VFO}) \end{aligned}$$

Thus, f_{VCO} varies by $\pm \Delta f$ as f_{CAR} is varied by $\pm \Delta f$.

The receiving frequency, f_R is given by

$$f_R = f_{VCO} - f_{CAR} \qquad (4)$$

Therefore, when f_{CAR} is shifted by $+\Delta f$, receiving frequency f'_R is given by

$$\begin{aligned} f'_R &= (f_{VCO} + \Delta f) - (f_{CAR} + \Delta f) \\ &= f_{VCO} - f_{CAR} \qquad (5) \end{aligned}$$

From equations (4) and (5),

$$f_R = f'_R$$

Thus the receiving frequency does not vary even if f_{CAR} is varied. However,

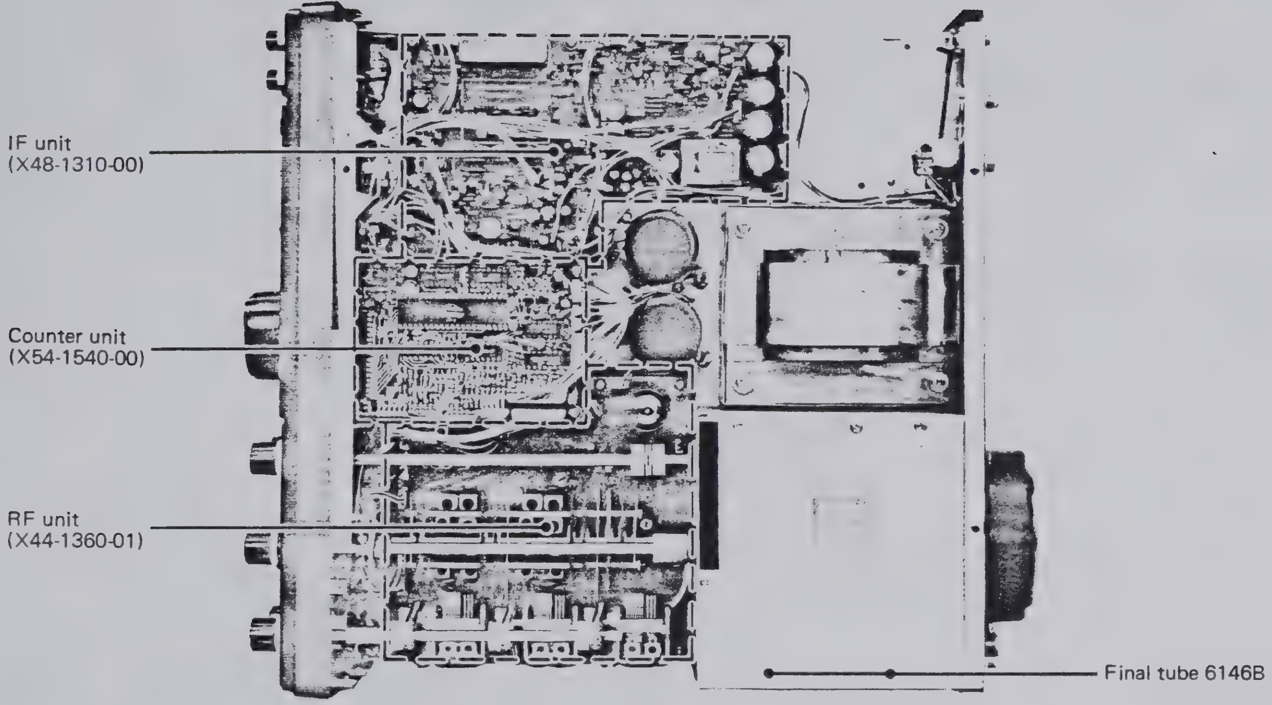
$$f_R = f_{VCO} - \text{IF frequency}$$

so the IF frequency varies as f_{VCO} varies.

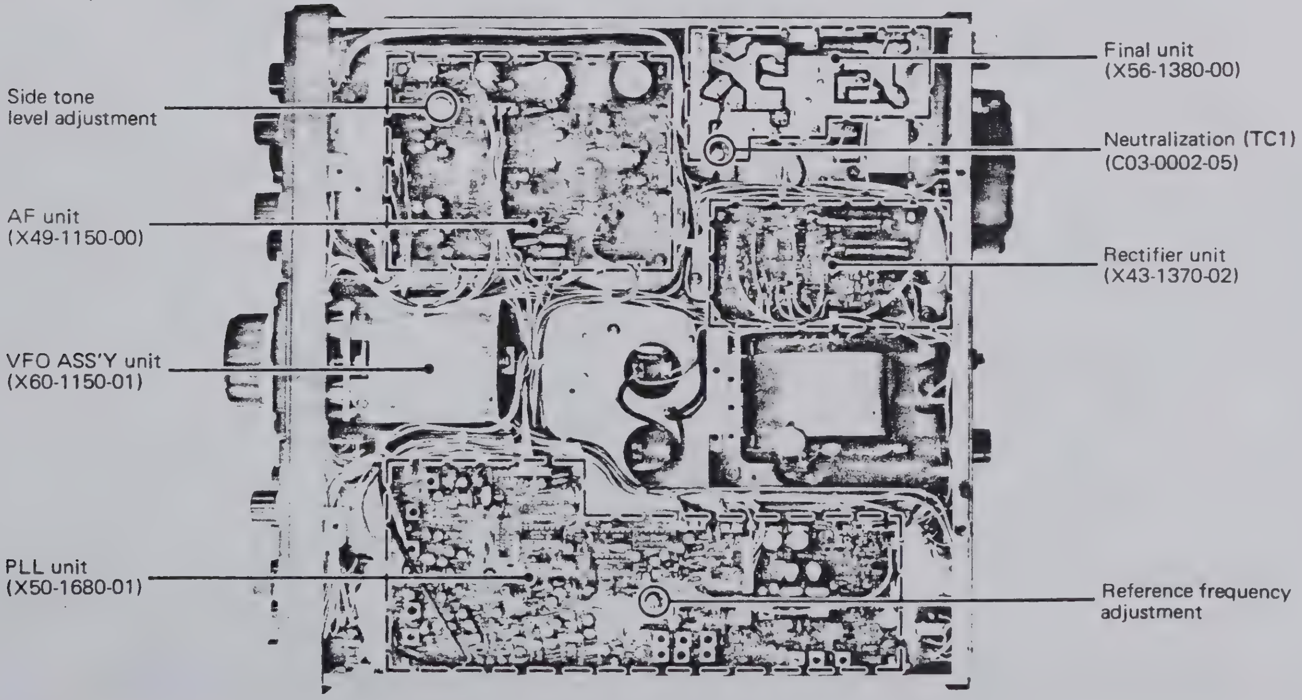
This means that the relative position of the IF filter passband to the carrier position (of the received signal) is shifted by the same amount as the f_{VCO} variation.

INSIDE VIEWS

TOP VIEW

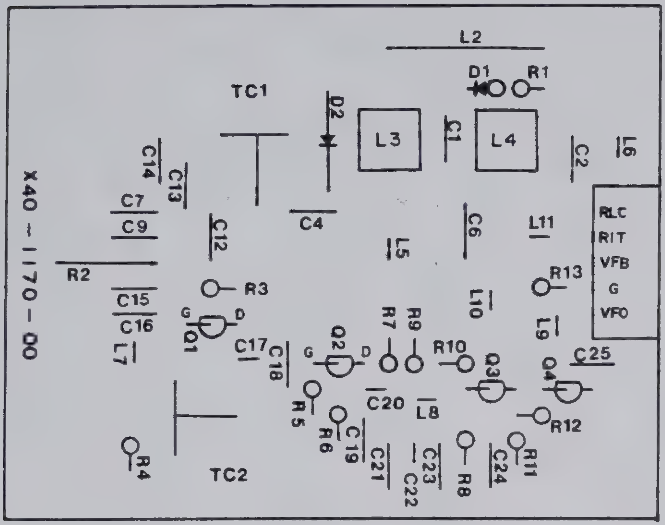


BOTTOM VIEW

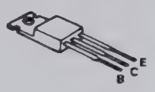


TS-530S PC BOARD VIEWS

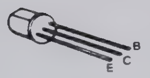
▼ VFO UNIT (X40-1170-00) View from component side



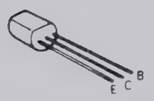
2SA473



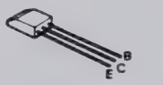
2SA562



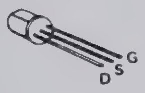
2SA778A
2SA1015
2SC945
2SC1515
2SC1815
2SC1959
2SC2240



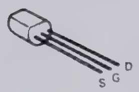
2SC460



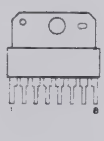
2SK19



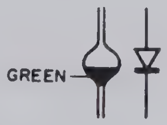
2SK30A



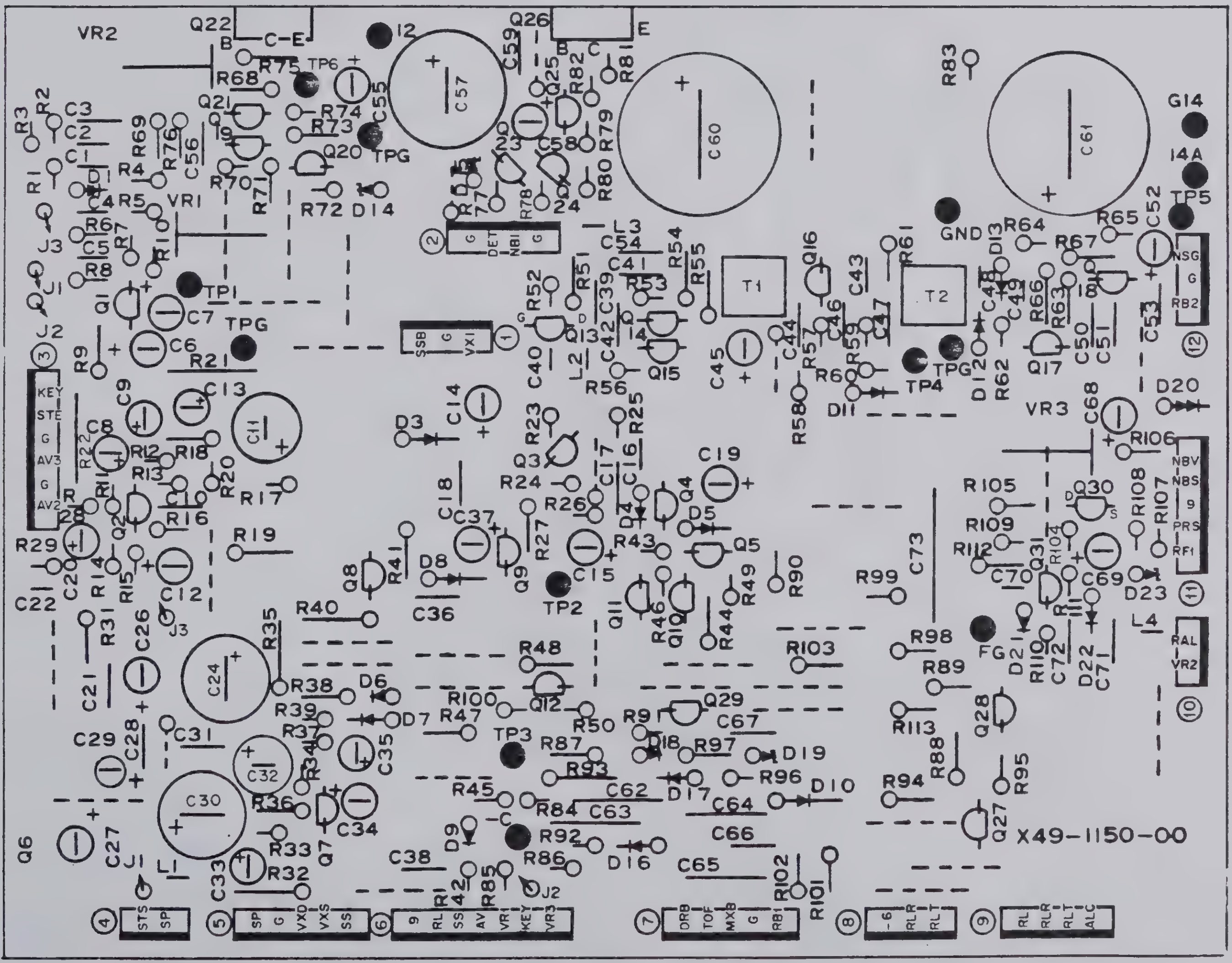
MB3712



MV-13

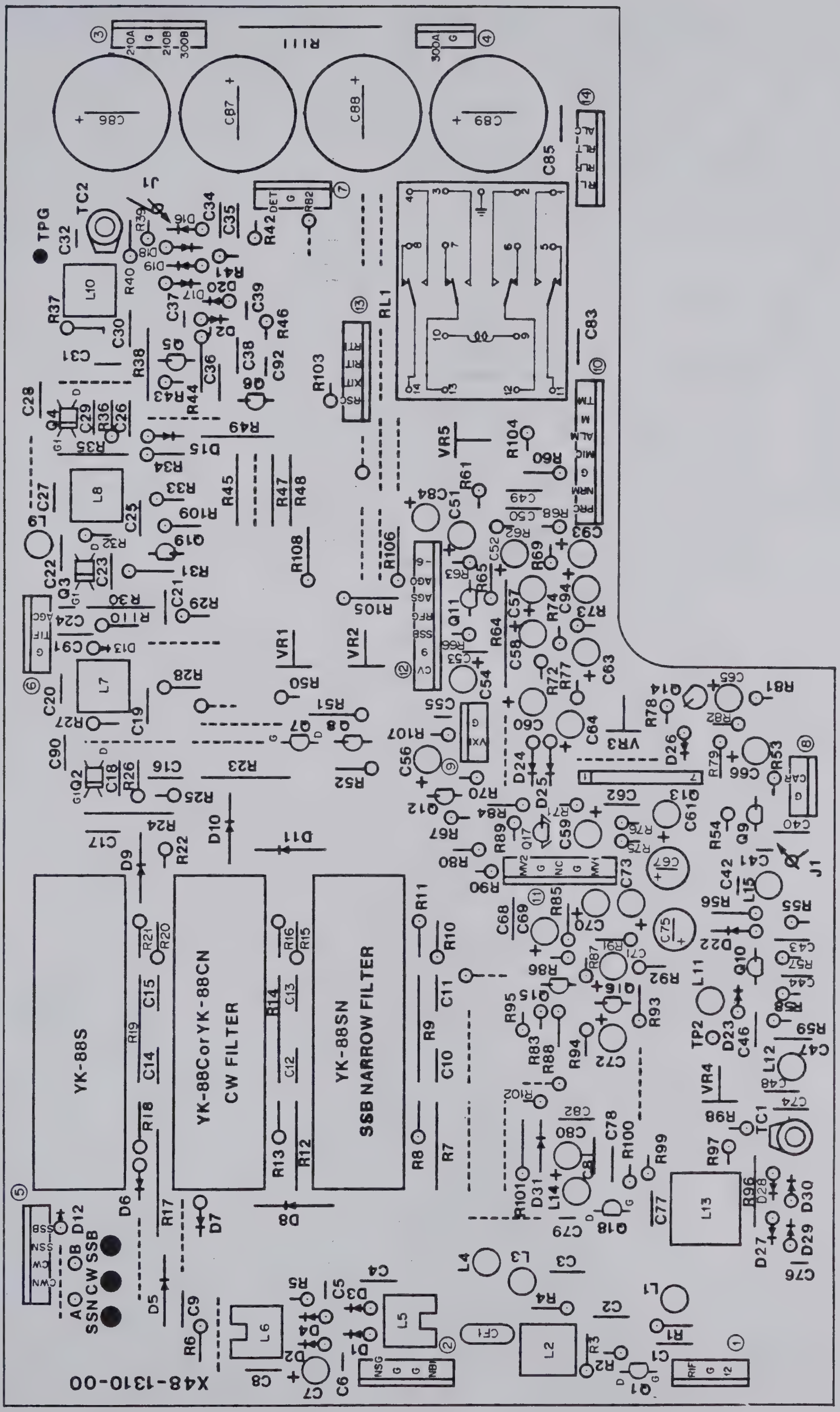


▼ AF UNIT (X49-1150-00) View from component side

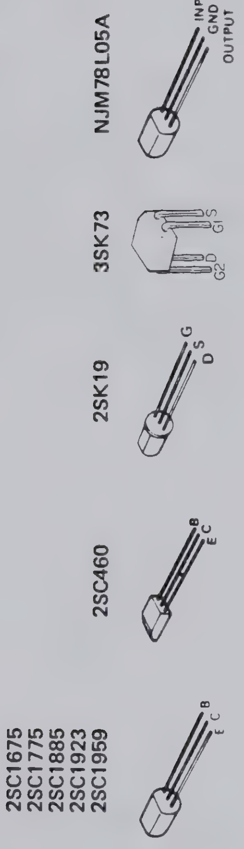


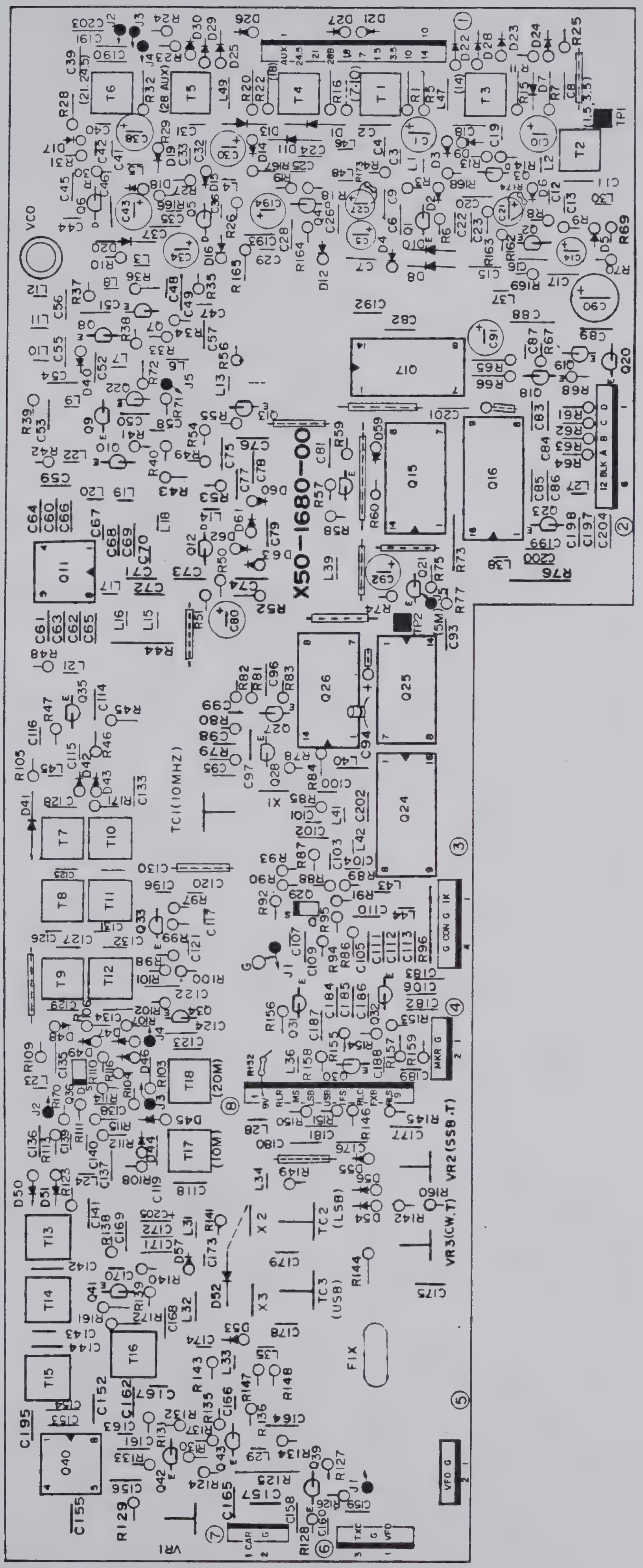
TS-530S PC BOARD VIEW

▼IF UNIT (X48-1310-00)   View from component side



TS-530S PC BOARD VIEW

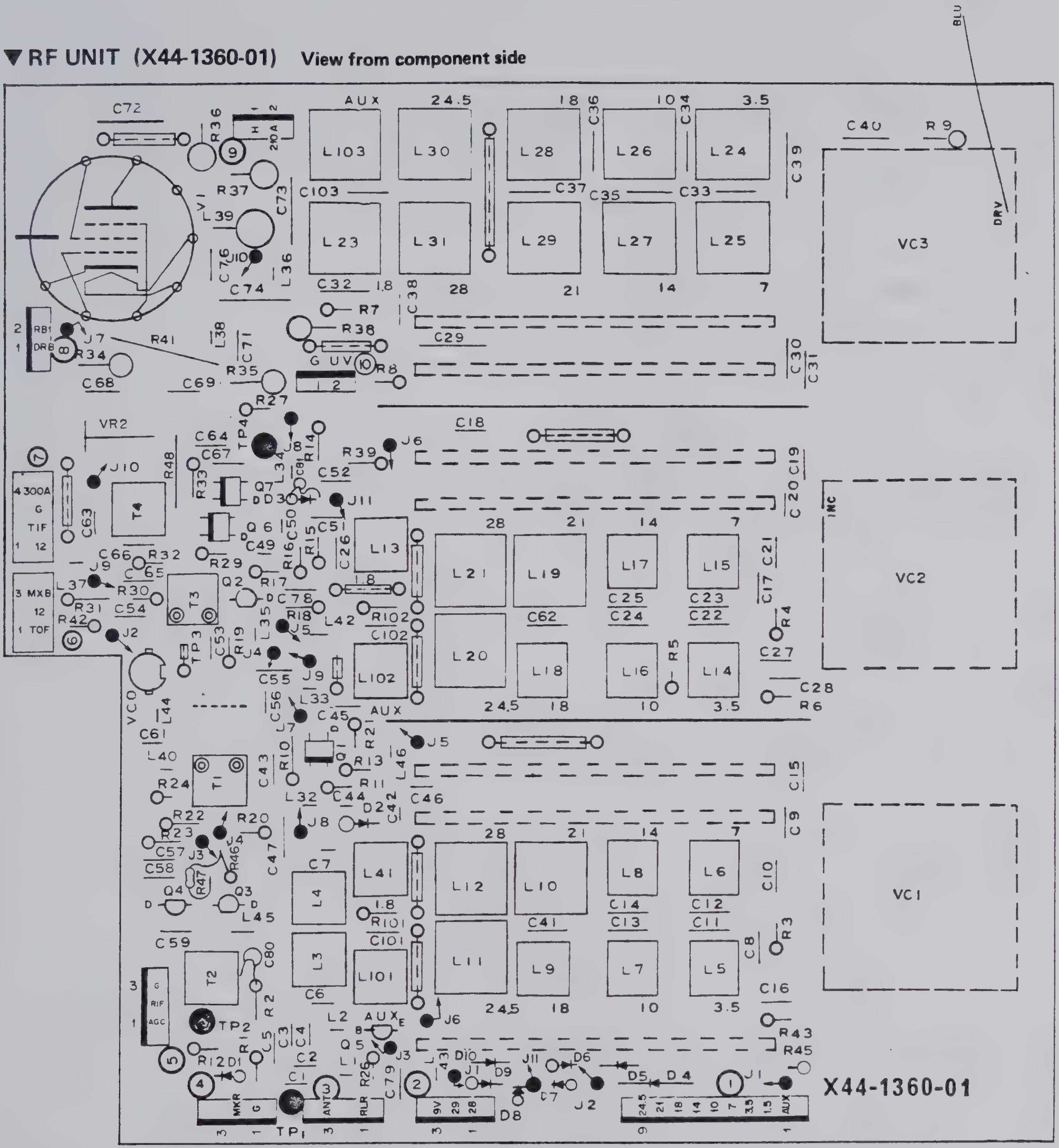




▼ PLL UNIT (X50-1680-01)   View from component side

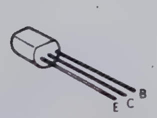
S-530S PC BOARD VIEW

▼RF UNIT (X44-1360-01) View from component side

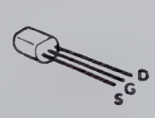


D1, 6, 7 : 3SK73(GR) Q2~4 : 2SK125 Q5 : 2SC1815(Y) D1 : 1S1587 D2, 3 1S2588 D4~10 : 1S1555 V1 : 12BY7A

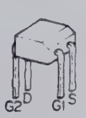
2SC1815



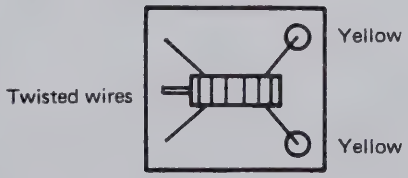
2SK125



3SK73



Attachment method of T1,T2



PARTS LIST

Note 1:
K: U.S.A. T: Britain W: Europe X: Australia

Note 2:
Only special type of resistors (example: cement, metal film, etc.) and capacitors (example: electrolytic, tantalum, mylar, temp. coeff. capacitors) are detailed in the PARTS LIST. For the value of all common type components, refer to the schematic diagram of the P.C. board illustration. Resistors not otherwise detailed are carbon type (1/4W or 1/8W).
Order carbon resistors and capacitors according to the following example:

A carbon resistor's part number is RD14BY 2E222J.

A ceramic capacitor's number is CK45F1H103Z, CC45TH1H220J.

RESISTOR

1. Type of the carbon resistor

RD14BY
RD14BB (small size)

RD14CY
RD14CB (small size)

2. Wattage

1W → 3A 3W → 3F 5W → 3H
2W → 3D 4W → 3G

3. Resistance value

②② ② → means 22 × 10² = 2200Ω (2.2 kΩ)

Example 221 → 220Ω 223 → 22 kΩ 225 → 2.2 MΩ
222 → 2.2 kΩ 224 → 220 kΩ

4. Tolerance

J = ±5% (Gold) K = ±10% (Silver)

CAPACITORS

Type I

CC	45	TH	1H	220	J
1'	2	3'	4	5	6

Type II

CK	45	F	1H	103	Z
1	2	3	4	5	6

1 = Type ..... ceramic, electrolytic, etc.
2 = Shape ..... round, square, etc.
3 = Temp range
3' = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

3' = CC45 ○ ○ ...
Ceramic capacitor (type I) temperature coeff. capacitor 1' 3'.

1st word (Color)	C (Black)	L (Red)	P (Orange)	R (Yellow)	S (Green)	T (Blue)	U (Violet)
ppm/°C	0	−80	−150	−220	−330	−470	−750

Ex. **CC45TH** = −470 ±60 ppm/°C

2nd Word	G	H	J	K	L
ppm/°C	±30	±60	±120	±250	±500

3 = CK45 ○
Ceramic capacitor (type II) 3

Cord	B	D	E	F
Operating temperature °C	−30 +85	−30 +85	−30 +85	−10 +70

5 = Capacitor value

Example. 010 → 1 pF
100 → 10 pF
101 → 100 pF
102 → 1000 pF = 0.001 μF
103 → 0.01 μF

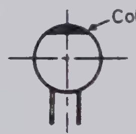
6 = Tolerance

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	±0.25	±0.5	±2	±5	±10	±20	+40 −20	+80 −20	+100 −0	More than 10 μF −10 ~ +50 Less than 4.7 μF −10 ~ + 75

Less than 10 pF

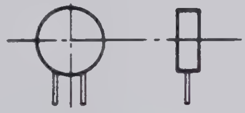
Cord	B	C	D	F	G
(pF)	±0.1	±0.25	±0.5	±1	±2

CC45



Type I

CK45



Type II

Abbreviation		Abbreviation	
Cap.	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

TS-530 SEMICONDUCTOR

☆: New parts

Item	Name	Parts No.	Remarks
Diode	1N60	V11-0051-05	
	1S1007	V11-4160-66	
	1S1555	V11-0076-05	
	1S1587	V11-0370-05	
	1S2588	V11-0414-05	
	V03C	V11-0290-05 200V 1.3A	
	V06B	V11-0219-05 100V 1.1A	
	V06E	V11-0285-05 400V 1.1A	
	V08J	V11-0282-05 800V 1.1A	
Varistor	MV-13	V21-0004-05	

Item	Name	Parts No.	Remarks
Vari-cap diode	1SV53A	V11-4161-36	
	1SV54GC	V11-4173-46	☆
LED	SLP-144	V11-6172-76	
	TLR-205	V11-3162-96	
Zener diode	WZ-061	V11-0243-05	
	WZ-090	V11-0240-05	
	WZ-110	V11-4161-46	
	XZ-055	V11-4105-50	
	XZ-060	V11-4101-20	
	XZ-090	V11-4167-06	

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
	E22-0207-05	Lug plate	
	E22-0472-05	Lug plate Final	☆
	E23-0046-04	Square terminal Switch, Relay	
	E30-0181-05	AC cord UL/CSA K, M	
	E30-0185-05	AC cord SAA X	
	E30-0585-05	AC cord CEE W	
	E30-0602-05	AC cord 3P T	
	E31-2086-05	Coax cable with plug	
	E90-0004-15	Plate cap	
	F05-4022-05	Fuse 4A W, T, X, M	
	F05-6021-05	Fuse 6A K, M	
	F09-0041-05	Fan	
	G01-0801-04	Gnd spring	
	G09-0410-05	D spring ϕ6	
	G13-0633-14	Cushion Meter	
	G13-0639-04	Cushion Indicating tube	
	G53-0502-04	Packing Case side	
	G53-0512-04	Packing Panel	
	H01-2741-04	Carton case (inside) K, W, X, M	☆
	H01-2742-04	Carton case (inside) T	☆
	H03-1797-04	Carton case (outside)	☆
	H10-2539-02	Packing fixture (F)	
	H10-2540-02	Packing fixture (R)	
	H20-0439-03	Protective cover	
	H25-0120-04	Protective bag	
	J02-0022-05	Foot (small)	
	J02-0049-14	Foot (large)	
	J13-0033-15	Fuse holder	
	J25-3015-04	PC board Relay	☆
	J32-0029-04	Hex. boss Relay, PLL	
	J32-0159-04	Hex. boss Final	
	J41-0006-05	Cord bushing K, M	
	J41-0024-15	Cord bushing W, T, X	
	J42-0409-04	Knob bushing +0.5 SHIFT	
	J61-0019-05	Vinyle tie	
	J61-0401-05	Nylon band	
	J61-0402-05	Free up belt W	
	K01-0406-05	Handle	☆
	K21-0723-04	Pointer knob BAND	
	K23-0738-04	Knob 1 METER, AGC	
	K23-0745-04	Knob VOX, NB, CAR	☆
	K27-0414-04	Push knob	
	K29-0713-04	Push knob +0.5 SHIFT	
	K29-0715-04	Pointer knob MODE	
	K29-0737-04	Knob 5 PLATE	
	K29-0738-04	Knob 6	
	K29-0744-04	Paddle knob STBY	☆
L1	L40-6891-13	Choke coil 6.8μH	
L2	L33-0635-05	Final choke	
L3	L34-1004-05	Final coil B 28 MHz	
L4	L34-0560-25	Final coil A	
L5	L33-0259-05	Choke coil 470μH	
T1	L01-8106-15	Power trans	
PS1,2	L39-0046-05	PS coil PLATE	
	N09-0256-05	Gnd screw	

Ref. No.	Parts No.	Description	Remarks
	N14-0115-05	Flange nut GND	
	N14-0509-05	Wing nut GND	
	N14-0517-05	Cap nut BIAS	
	N30-4012-46	Round screw Foot (large)	
	N30-4016-46	Round screw GND	
	N30-4025-46	Round screw Foot (accessory)	
	N33-3006-41	Round flat screw SP	
	N35-3008-45	Bind screw Foot (small)	
	N35-4006-41	Bind screw Case	
	N87-4012-46	Self tapping screw Foot (large)	
	N89-3006-46	Bind tapping screw Final cover	
	N99-0306-04	Hex. head screw VFO	
R22	RC05GF2H221J	Solid 220Ω 1/2W	
R24	RC05GF3A103K	Solid 10kΩ 1W	
R25,26	RC05GF2H474J	Solid 470kΩ 1/2W	
R28	RC05GF2H330J	Solid 33Ω 1/2W	
VR1	R01-3414-05	Pot. 10kΩ(A) AF	☆
VR2	R01-3415-05	Pot. 10kΩ(B) RF	☆
VR3	R01-3417-05	Pot. 10kΩ(F) IF SHIFT	☆
VR4	R01-2405-05	Pot. 5kΩ(B) RIT/XIT	
VR5	R01-3414-05	Pot. 10kΩ(A) MIC	☆
VR6	R01-3416-05	Pot. 10kΩ(B) CAR	☆
VR7	R01-4408-05	Pot. 50kΩ(B) VOX GAIN	☆
VR8	R01-0404-05	Pot. 300Ω(B) NB	
VR9	R01-6401-05	Pot. 250kΩ(B) DELAY	
VR10	R01-0405-05	Pot. 300Ω(B) ANTI	☆
VR11,12	R01-3411-05	Pot. 10kΩ(B) RF OUT, BIAS	
S1~6	S40-2419-05	Push switch PC board type	
S7	S40-2403-05	Push switch +0.5 SHIFT	
S8,9	S36-1403-05	See saw switch HEATER, POWER	☆
S11	S01-1423-05	Rotary switch AGC	
S13	S01-1427-05	Rotary switch METER	☆
S14,16	S40-2415-05	Push switch Lead type	
S17	S33-2403-05	Paddle switch STBY	☆
S18	S01-2429-05	Rotary switch MODE	☆
S20	S31-2007-05	Slide switch SG	
S22	S01-3406-05	Rotary switch FINAL	
S23	S31-2027-05	Slide switch AC volt W,T,X,M	
RL1	S51-2407-05	Relay	
	T07-0215-05	Speaker	☆
	T40-0022-05	Motor FAN	
	X43-1370-02	Rectifier unit	☆
	X44-1360-01	RF unit	☆
	X48-1310-00	IF unit	☆
	X49-1150-00	AF unit	☆
	X50-1680-01	PLL unit	☆
	X54-1540-00	Counter unit	
	X56-1380-00	Final unit	
	X60-1150-01	VFO ass'y unit	☆

PARTS LIST

Ref. No.	Parts No.	Description	Remarks
L44	L40-2282-01	Ferri-inductor 0.22μH	
L45,46	L40-1511-03	Ferri-inductor 150μH	
T1	L19-0303-05	Wide bandwidth trans	
T2	L30-0509-05	IFT	
T3	L19-0303-05	Wide bandwidth trans	
T4	L30-0509-05	IFT	
R34	RC05GF2H104J	Solid 100kΩ 1/2W	
R35	RC05GF2H151J	Solid 150Ω 1/2W	
R36	RC05GF2H104J	Solid 100kΩ 1/2W	
R37	RS14AB3A332J	Metal film 3.3kΩ 1W	
R38	RC05GF2H474J	Solid 470kΩ 1/2W	
VR2	R12-6404-05	Trim. pot 470kΩ	
	R92-0150-05	Short jumper	
	S29-7401-05	Rotary wafer ass'y	

IF UNIT (X48-1310-00)

Ref. No.	Parts No.	Description	Remarks
C2	C91-0457-05	C 0.022μF	
C5,6	CC45SL1H470J	C 47pF	
C7	CE04W1C100M	E 10μF 16V	
C9~15	C91-0457-05	C 0.022μF	
C18	C91-0456-05	C 0.047μF	
C19	C91-0457-05	C 0.022μF	
C20	CC45SL1H100D	C 10pF ±0.5pF	
C23	C91-0457-05	C 0.022μF	
C24	CC45SL1H100D	C 10pF ±0.5pF	
C25	C91-0457-05	C 0.022μF	
C26	C91-0456-05	C 0.047μF	
C27	CC45SL1H470J	C 47pF	
C28	C91-0456-05	C 0.047μF	
C29	C91-0457-05	C 0.022μF	
C30	C91-0456-05	C 0.047μF	
C31	CC45SL1H100D	C 10pF ±0.5pF	
C32	CC45UJ1H070D	C 7pF ±0.5pF	
C35	CQ92M1H333K	ML 0.033μF	
C36	C91-0456-05	C 0.047μF	
C37	CC45SL1H470J	C 47pF	
C38	C91-0457-05	C 0.022μF	
C40	C91-0456-05	C 0.047μF	
C44,47	CC45SL1H470J	C 47pF	
C49,50	CC45SL1H101J	C 100pF	
C51	CE04W1H010M	E 1μF 50V	
C52	CE04W1C100M	E 10μF 16V	
C53	CQ92M1H153K	ML 0.015μF	
C54,56~58	CE04W1H010M	E 1μF 50V	
C59	CE04W1H3R3M	E 3.3μF 50V	
C60,61,63	CE04W1H010M	E 1μF 50V	
C64	CE04W1H4R7M	E 4.7μF 50V	
C65	CE04W1C100M	E 10μF 16V	
C66	CE04W1H4R7M	E 4.7μF 50V	
C67	CE04W1A221M	E 220μF 10V	
C68	CQ92M1H473K	ML 0.047μF	
C69	CE04W1A470M	E 47μF 10V	
C70	CE04W1C100M	E 10μF 16V	
C71	CE04W1H010M	E 1μF 50V	
C72	CE04W1H3R3M	E 3.3μF 50V	
C73	CE04W1H010M	E 1μF 50V	
C74	C91-0457-05	C 0.022μF	
C75	CE04W1A221M	E 220μF 10V	
C76	CC45UJ1H100D	C 10pF ±0.5pF	
C77	CC45SL1H101J	C 100pF	
C78	C91-0457-05	C 0.022μF	
C79	CC45CH1H050C	C 5pF ±0.25pF	
C80	CE04W1C220M	E 22μF 16V	
C84	CE04W1H010M	E 1μF 50V	
C85	C91-0456-05	C 0.047μF	
C86~89	CE04W2V220	E 22μF 350V	
C91,92	CC45SL1H470J	C 47pF	
C93,94	CE04W1C100M	E 10μF 16V	
TC1,2	C05-0030-15	Ceramic trimmer 20pF	
	E23-0401-05	Round terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0573-05	Mini connect wafer 5P	
	E40-0773-05	Mini connect wafer 7P	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-1511-03	Ferri-inductor 150μH	
L2	L34-0940-05	Tuning coil	
L3,4	L40-1511-03	Ferri-inductor 150μH	
L5	L34-0942-05	Tuning coil	
L6	L34-0997-05	Tuning coil	
L7,8	L34-0535-05	Tuning coil	
L9	L40-1511-03	Ferri-inductor 150μH	
L10	L34-0536-05	Tuning coil	
L11,12	L40-1511-03	Ferri-inductor 150μH	
L13	L34-0567-05	Tuning coil BM	
L14	L40-4711-03	Ferri-inductor 470μH	
L15	L40-1511-03	Ferri-inductor 150μH	
CF1	L72-0324-05	Ceramic filter 8.83MHz NB	☆
XF1	L71-0208-05	MCF YK-88S	
R111	RS14GB3D471J	Metal film 470Ω 2W	
VR1	R12-3045-05	Trim. pot 10kΩ	
VR2	R12-6401-05	Trim. pot 470kΩ	
VR3	R12-5030-05	Trim. pot 100kΩ	
VR4	R12-0401-05	Trim. pot 100Ω	
VR5	R12-3045-05	Trim. pot 10kΩ	
	R92-0150-05	Short jumper	
RL1	S51-4401-05	Relay LZN-4	

AF UNIT (X49-1150-00)

Ref. No.	Parts No.	Description	Remarks
C1,2	CQ92M1H123K	ML 0.012μF	
C3	CQ92M1H223K	ML 0.022μF	
C4,5	CQ92M1H123K	ML 0.012μF	
C6	CE04W1C100M	E 10μF 16V	
C7	CE04W1H010M	E 1μF 50V	
C8	CE04W1HR10M	E 0.1μF 50V	
C9	CE04W1C100M	E 10μF 16V	
C10	CQ92M1H103K	ML 0.01μF	
C11	CE04W1A101M	E 100μF 10V	
C12	CE04W1HR47M	E 0.47μF 50V	

PARTS LIST

Ref. No.	Parts No.	Description	Re-marks
C113	CC45SL1H101J	C 100pF	
C115	CC45RH1H100D	C 10pF ±0.5pF	
C116	CC45TH1H050C	C 5pF ±0.25pF	
C117	CC45CH1H010C	C 1pF ±0.25pF	
C118	CC45RH1H560J	C 56pF	
C120	CC45CH1H020C	C 2pF ±0.25pF	
C121	CC45SL1H470J	C 47pF	
C123	CC45RH1H390J	C 39pF	
C125	CC45TH1H330J	C 33pF	
C126	CC45TH1H150J	C 15pF	
C127	CC45TH1H330J	C 33pF	
C130	CC45UJ1H150J	C 15pF	
C131	CC45UJ1H050C	C 5pF ±0.25pF	
C132	CC45UJ1H150J	C 15pF	
C139	CC45SL1H100D	C 10pF ±0.5pF	
C140	CC45RH1H220J	C 22pF	
C142	CC45RH1H470J	C 47pF	
C143	CC45RH1H220J	C 22pF	
C144	CC45RH1H470J	C 47pF	
C159	CC45SL1H330J	C 33pF	
C160	CC45SL1H100D	C 10pF ±0.5pF	
C162	CC45CH1H010C	C 1pF ±0.25pF	
C163	CC45SL1H150J	C 15pF	
C166	CC45SL1H100D	C 10pF ±0.5pF	
C167	CC45CH1H020C	C 2pF ±0.25pF	
C169	CC45SL1H101J	C 100pF	
C172	C91-0456-05	C 0.047μF	
C173	CC45CH1H010C	C 1pF ±0.25pF	
C174	CC45UJ1H680J	C 68pF	
C178,179	CC45SL1H220J	C 22pF	
C182,183	C91-0456-05	C 0.047μF	
C184	CC45CH1H270J	C 27pF	
C185	CC45CH1H390J	C 39pF	
C186	CC45CH1H101J	C 100pF	
C187	CC45SL1H221J	C 220pF	
C188	CC45SL1H220J	C 22pF	
C189	CC45SL1H050C	C 5pF ±0.25pF	
C194	CE04W1A470M	E 47μF 10V	
C196	CC45SL1H100D	C 10pF ±0.5pF	
C197~202	C91-0456-05	C 0.047μF	
C205	CE04W1HR47M	E 0.47μF 50V	
TC1	C05-0029-15	Ceramic trimmer 50pF	
TC2,3	C05-0056-05	Ceramic trimmer 30pF	
	E04-0154-05	Coax connector	
	E23-0046-04	Square terminal	
	E40-0273-05	Mini connect wafer 2P	
	E40-0373-05	Mini connect wafer 3P	
	E40-0473-05	Mini connect wafer 4P	
	E40-0673-05	Mini connect wafer 6P	
	E40-0973-05	Mini connect wafer 9P	
	E40-1073-05	Mini connect wafer 10P	
L1~7	L40-1511-03	Ferri-inductor 150μH	
L8	L40-4701-03	Ferri-inductor 47μH	
L9	L40-1592-02	Ferri-inductor 1.5μH	
L10	L40-1092-02	Ferri-inductor 1μH	
L11	L40-1292-02	Ferri-inductor 1.2μH	
L12	L40-1892-02	Ferri-inductor 1.8μH	
L13,14	L40-4711-03	Ferri-inductor 470μH	
L15,16	L40-8201-03	Ferri-inductor 82μH	
L17	L40-1511-03	Ferri-inductor 150μH	
L18~20	L40-2701-03	Ferri-inductor 27μH	
L21~24,27~30	L40-1511-03	Ferri-inductor 150μH	

Ref. No.	Parts No.	Description	Re-marks
L31	L40-2211-03	Ferri-inductor 220μH	
L32	L33-0636-05	Choke coil 20μH	
L33~36	L40-1511-03	Ferri-inductor 150μH	
L37	L40-4711-03	Ferri-inductor 470μH	
L38,39	L40-1511-03	Ferri-inductor 150μH	
L40	L40-4711-03	Ferri-inductor 470μH	
L41,42	L40-4701-03	Ferri-inductor 47μH	
L43,44	L40-2211-03	Ferri-inductor 220μH	
L45~49	L40-1511-03	Ferri-inductor 150μH	
T1	L32-0195-05	OSC coil 7, 10 MHz	
T2	L32-0193-05	OSC coil 1.5, 3.5 MHz	
T3	L32-0196-05	OSC coil 14 MHz	
T4	L32-0199-05	OSC coil 18 MHz	
T5	L32-0198-05	OSC coil 28 MHz	
T6	L32-0197-05	OSC coil 21, 24.5 MHz	
T7	L34-0714-05	Tuning coil	
T8	L34-0715-05	Tuning coil	
T9	L34-0716-05	Tuning coil	
T10	L34-0717-05	Tuning coil	
T11	L34-0718-05	Tuning coil	
T12	L34-0757-05	Tuning coil	
T13	L34-0711-05	Tuning coil	
T14	L34-0713-15	Tuning coil	
T15	L34-0712-05	Tuning coil	
T16	L32-0201-05	OSC coil 8.83 MHz	
T17	L34-0709-05	Tuning coil 10 MHz	
T18	L34-0710-05	Tuning coil 20 MHz	
X1	L77-0482-05	Crystal 10 MHz	
X2	L77-0486-05	Crystal 8.8285 MHz	
X3	L77-0485-05	Crystal 8.8315 MHz	
VR1	R12-5030-05	Trim. pot 100kΩ	
VR2,3	R12-1040-05	Trim. pot 4.7kΩ	
	R92-0150-05	Short jumper	

COUNTER UNIT (X54-1540-00)

Ref. No.	Parts No.	Description	Re-marks
C2	C91-0456-05	C 0.047μF	
C3	C91-0457-05	C 0.022μF	
C4	CC45SL1H150J	C 15pF	
C6	CE04W1A470Q	E 47μF 10V	
C7	CE04W1A101Q	E 100μF 10V	
C8,9	C91-0456-05	C 0.047μF	
C11	CE04W1C101M	E 100μF 16V	
C12	CE04W1V100Q	E 10μF 35V	
C13	CQ92M1H103K	ML 0.01μF 50V	
C14~16	CE04W1V100Q	E 10μF 35V	
C17,18	C91-0456-05	C 0.047μF	
C19	CQ92M1H103K	ML 0.01μF 50V	
C21,22	CC45SL1H050C	C 5pF ±0.25pF	
C23	CE04W1A330Q	E 33μF 10V	
C24~26	C91-0456-05	C 0.047μF	
C28	CE04W1H100M	E 10μF 50V	
	J31-0502-04	PC board collar	
	J42-0404-05	PC board bushing	
L1	L40-4711-03	Ferri-inductor 470μH	
L2	L40-1011-04	Ferri-inductor 100μH	
L3	L40-2211-03	Ferri-inductor 220μH	
L4	L40-1511-03	Ferri-inductor 150μH	

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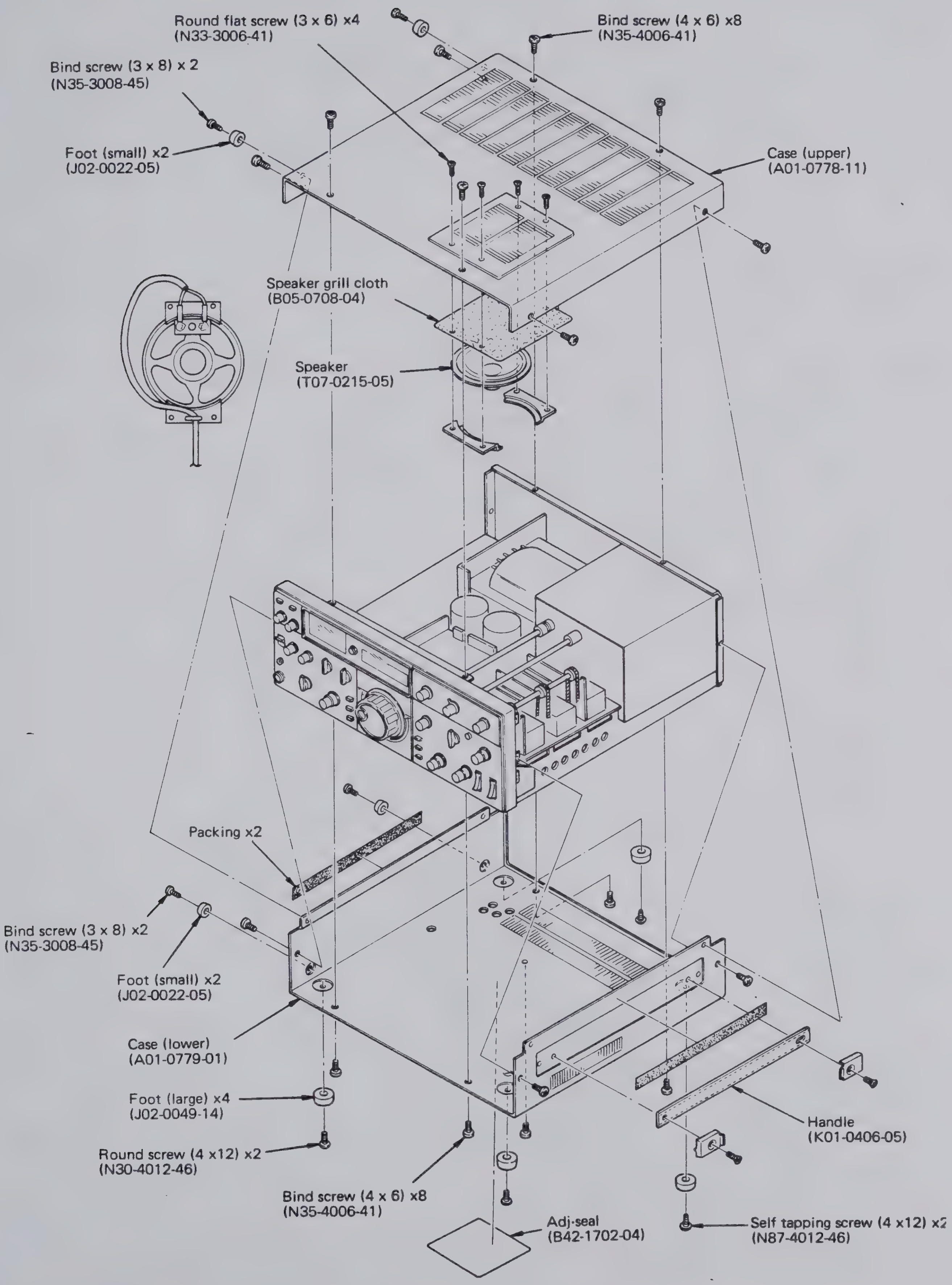

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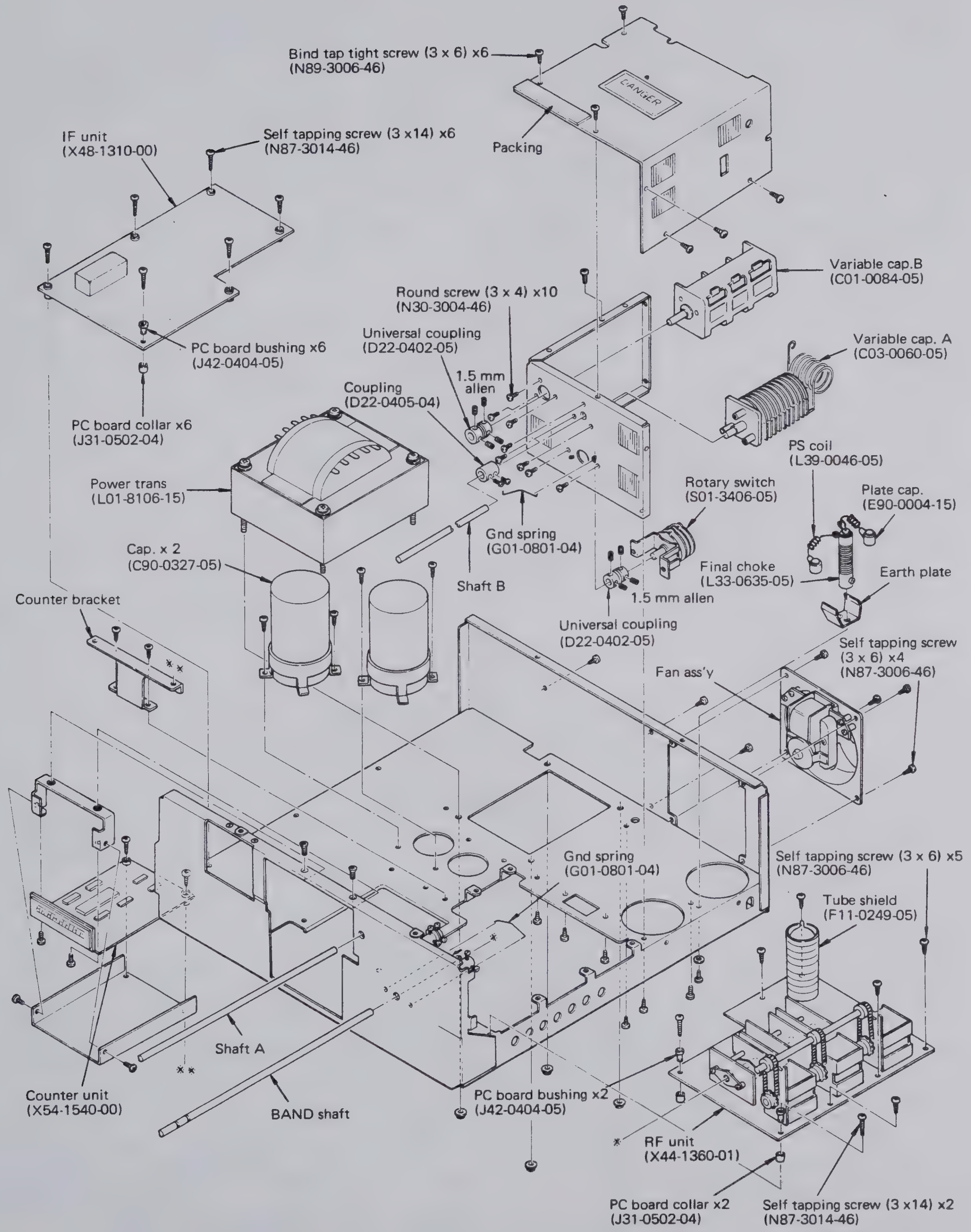

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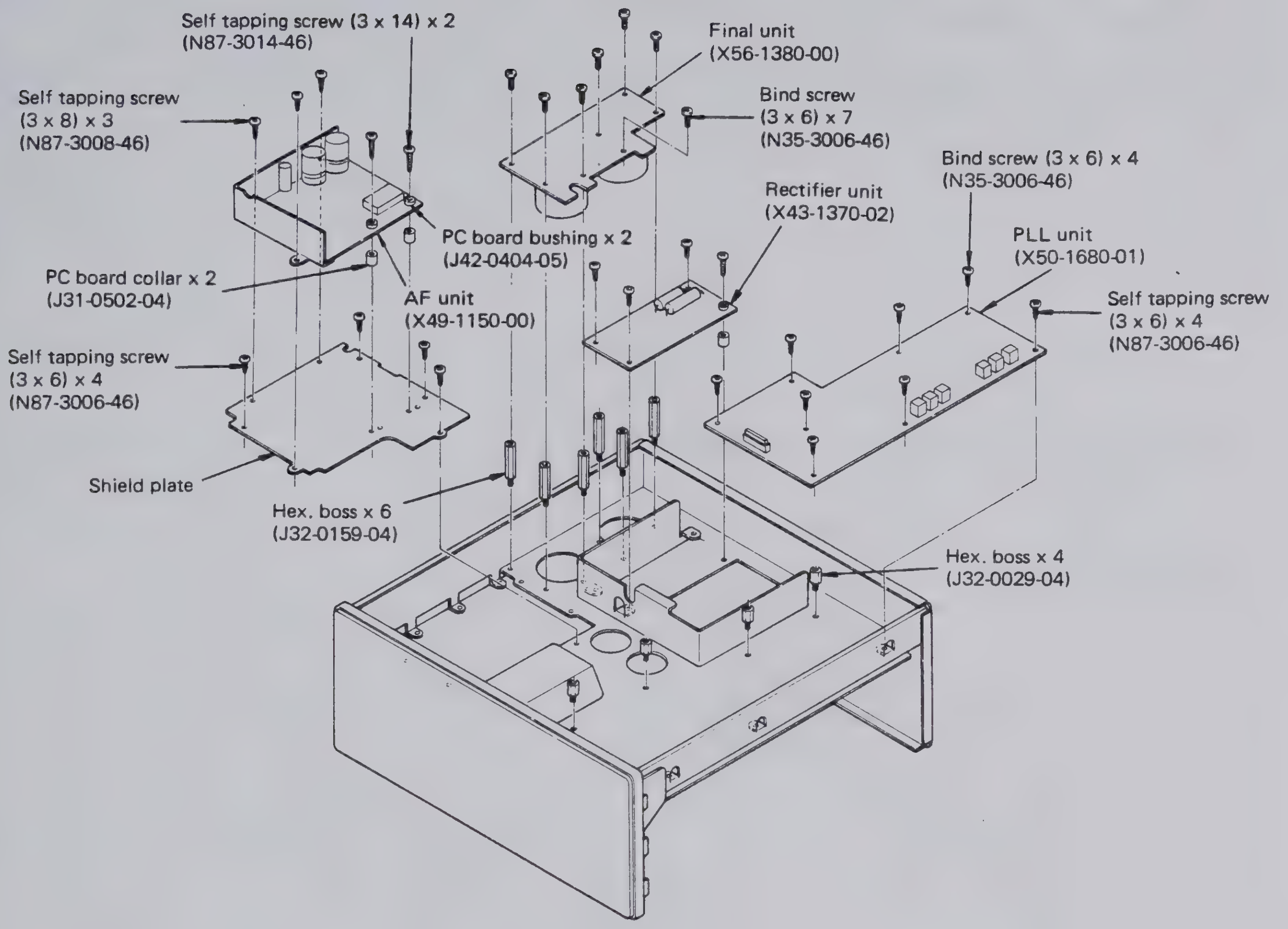
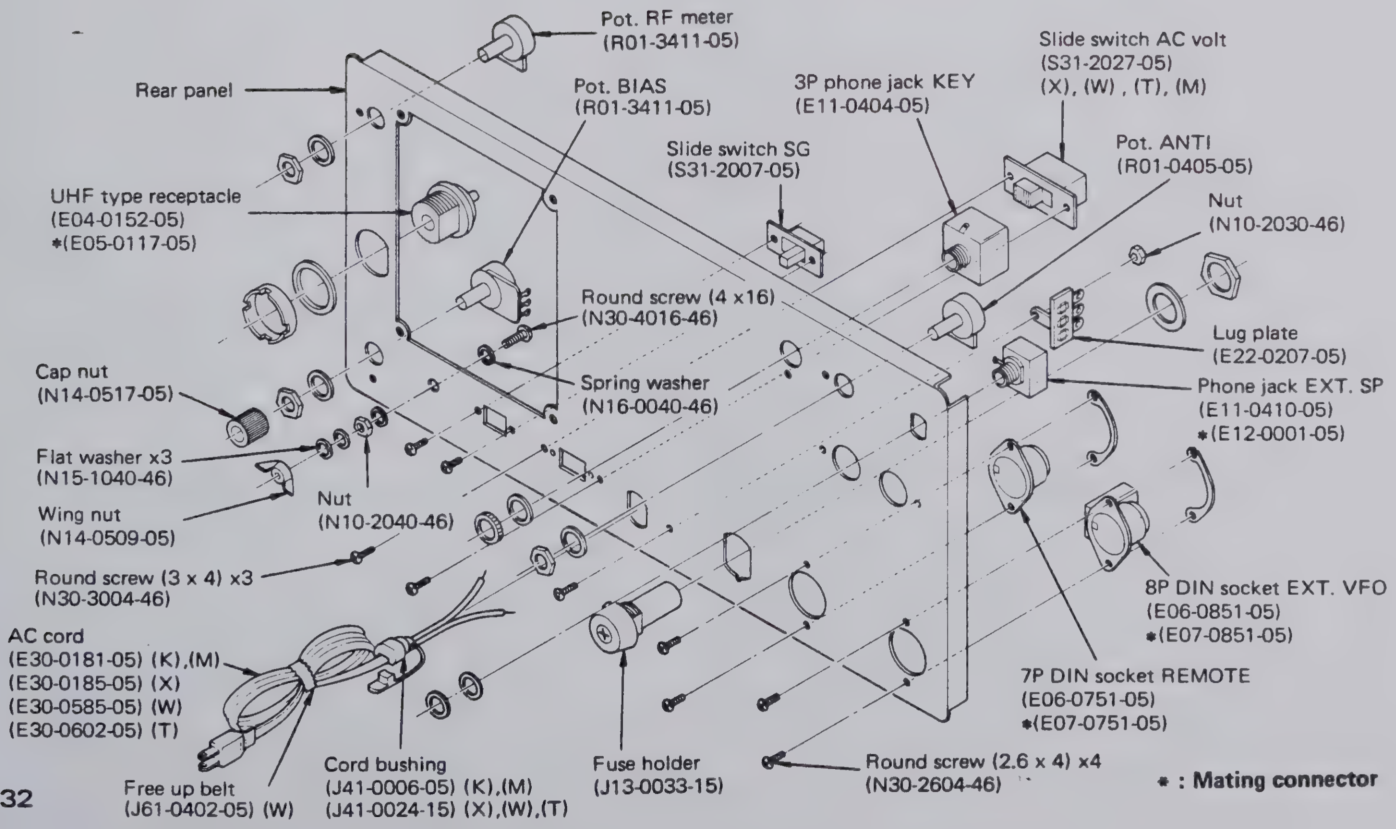




*** : Mating connector**

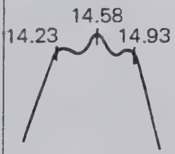
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
1. 9V AVR and 3.2V adjustment		DVM	AF	TP-6 Pin-5, connector ⑪	AF	VR2 VR3	9V 3.2V	9V±0.05V 3.2V±0.05V	RF1 (FET bias)
2. Base current adjustment	SG SW : ON MODE: USB METER : IP HEATER : ON DRIVE :Fully clockwise STBY : SEND BIAS pot. : Adjust	1P meter			Rear panel	Bias pot.		Set to 60mA	
	STBY REC, SG SW OFF								
3. Carrier adjustment①	IF SHIFT : Centered MODE : USB	RF VTVM	IF	Pin1, connector ⑧	PLL	NOTE : T16	0.3V	0.3V±1dB	NOTE : The slug of T16 should be turned counter clockwise for this adjustment after the peak point is determined.
	MODE : LSB STBY : REC ↕ SEND	F. counter				VR2	Obtain the same frequency for both transmission and reception	±20 Hz	
	STBY : REC					TC2	8828.50 kHz		
	MODE : USB					TC3	8831.50 kHz		
	MODE : CW STBY : SEND					VR3	8830.70 kHz		
	STBY : REC								
4. IF SHIFT check	MODE : LSB Rotate the IF SHIFT and check the variation	F. counter	IF	Pin 1, connector ⑧				Set IF SHIFT to center. More than + 1.1 kHz , Less than −1.1 kHz.	
	MODE : USB Same as above								
	STBY : SEND Regardless of the IF SHIFT setting							8831.50 kHz	USB
								8828.50 kHz	LSB
	STBY : REC								
5. VFO, RIT check and adjustment	Scale 0~500							Should rotate smoothly and have no abnormal noise.	
	Rear panel SG SW OFF VFO : 250	RF VTVM	PLL	Pin 1, connector ⑥ 2P(GND)	Adjust if the voltage is out of specification. VFO	TC2	200mV	200 mV±1 dB	
	MODE : CW STBY : SEND	F. counter	Rear panel	EXT VFO 1P, 7P (GND)		Adjust if the frequency is out of specification.	800 Hz UP	800±50 Hz	CW SHIFT

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	RIT OFF								
6. Reference oscillator adjustment		F. counter	PLL	TP2	PLL	TC1	1000.000 kHz		
7. VCO adjustment and check	Check the frequencies at the following points and adjust coils until those given in brackets are obtained.	F. counter DVM	PLL PLL	D40 TP1					

BAND \ VFO	0	250	500	Adjusting point	
				Unit	Part
1.5	10.33 MHz	10.58 MHz (4.0V)	10.83 MHz	PLL	T2
3.5	12.33	12.58	12.83		
7	15.83	16.08 (4.75V)	16.33		T1
10	18.83	19.08	19.33		
14	22.83	23.08 (4.5V)	23.33		T3
18	26.83	27.08 (5.0V)	27.33		T4
21	29.83	30.08 (3.5V)	30.33		T6
24.5	33.33	33.58	33.83		
28	36.83	37.08	37.33		T5
28.5	37.33	37.58	37.83 (4.75V)		
29	37.83	38.08	38.33		
29.5	38.33	38.58	38.83		

Item	Condition	Test equipment	Unit	Terminal	Unit	Parts	Method	Specification	Remarks
	Check the level at each of the above points.	RF VTVM	RF	TP3				$1V^{+3}_{-2}$ dB	
PLL lock range	Both edges of the VFO frequency in each band.							Display should indicate.	
8. BPF-A	Disconnect connectors ① and ⑤ on the PLL unit. Connect the cathode of D24 (1S1555) to the jumper wire next to R44 with a clip lead. Connect the sweep generator RF output to the EXT-VFO connector.	Sweep generator Oscilloscope	PLL	Q35 Ⓔ	PLL	T13 T14 T15	Adjust until the response shown to the right is obtained.		

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
13. Coil pack adjustment	Connect the SSG (40dB) to the ANT terminal DRIVE : 12:00 While adjusting, gradually decrease the SSG output level down to −6 dB. Adjust at the following points:	AF VTVM Oscilloscope	Rear panel	EXT. SP	RF	ANT coil RF coil	Max. audio output		
14. Drive coil adjustment	CAL : ON CAR VR : optinum level METER : ALC HEATER : ON MODE : CW SG SW : OFF ANT : 50Ω dummy should be connected. Connect pin 2 to pin 4, connector ⑦ on the AF unit with a clip lead. Receive the marker frequency in the following bands and obtain the peak level by adjusting the DRIVE control. Set the STBY switch to SEND and adjust each drive coil.	50Ω dummy			RF	DRIVE coil	Max. ALC meter reading		NOTE: The 50Ω dummy should be connected to the ANT terminal. Otherwise drive tuming will be incorrect.
	STBY : REC								

Item 13 adjustment points:

No.	BAND	VFO	f	Parts
1	1.5	400	1.9 MHz	1.8
2	3.5	250	3.75	3.5
3	7	150	7.15	7
4	10	125	10.125	10
5	14	175	14.175	14
6	18	125	18.125	18
7	21	225	21.225	21
8	24.5	450	24.950	24.5
9	28.5	300	28.800	28

Item 14 bands:

BAND	VFO	Parts
1.5	400	1.8
3.5	250	3.5
7	150	7
(10)	(125)	10
14	175	14
(18)	(125)	18
21	225	21
(24.5)	(450)	24.5
28.5	300	28

(   ) : See note **BEFORE** adjustment

Note :

TRANSMITTING ON WARC BANDS

As supplied, the TS-530S will receive but not transmit on the 3 new WARC bands. If transmit capability is desired, a minor wiring change is required.

1. For all 3 bands : Break the line between the RF unit X44-1360-01, connector #6, Pin #1 (TOF terminal) and AF unit X49-1150-00, connector #7, Pin #4 (TOF terminal).
2. Or, for individual Bands : On the RF unit X44-1360-01 :

Band	Remove (or Cut) Part
10 MHz	D4
18 MHz	D5
24.5 MHz	D6

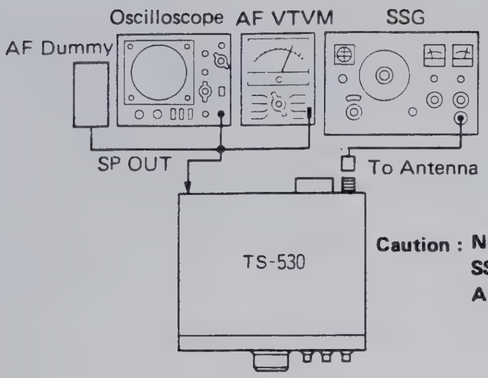
ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
NB adjustment	AGC : FAST Disconnect the SSG output from the ANT terminal, and connect the noise generator output in it's place. Set the noise generator output level to S5~7.	Speaker	Rear panel	EXT. SP					
	NB : ON							The NB must provide adequate effect.	
					If adequate effect is not obtained, repeat the adjustment several times.				
	Reduce the noise generator output level to below the threshold of sensitivity. Turn the NB LEVEL control fully clockwise.							Noise must be blanked.	
	NB : OFF								
19. Neutralization trimmer adjustment	BAND : 28, +0.5 SHIFT : ON VFO :300 SG SW : ON STBY : SEND Tune the DRIVE, PLATE and LOAD	Power meter Sync'ed scope	Rear panel	ANT					Tune-up for MAX RF output.
	SG SW : OFF							RF output must be 0.	
	METER : ALC Set the ALC to maximum with the DRIVE control. Increase oscilloscope sensitivity.					Neutralization trimmer TC1	Minimum		
	Reduce oscilloscope sensitivity (5V/div.). SG SW : ON							The normal power must be obtained. The signal waveform must be normal.	
20. Side tone, semi-break-in function adjustment	Connect a power meter to the ANT terminal. Plug key into the rear Key jack to transmit in any band.	Oscilloscope AF VTVM	Rear panel	EXT. SP	AF	VR1	0.63V/8Ω		
	Operate the key.							The key must control RF output.	
	STBY : REC VOX : ON Operate the key							Semi-break-in operation should be available.	

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specification	Remarks
		Test equipment	Unit	Terminal	Unit	Parts	Method		
	AG : 300Hz ↕ 2700Hz				PLL	TC3	Adjust until the same level is obtained for both 300Hz and 2700Hz (equal audio rolloff).		
	MODE : LSB same as above					TC2			
	AG : 400Hz AG : 2600Hz							More than 1/2 with respect to the 1500Hz signal level observed on the scope.	
	After completing the above adjustment, readjust carrier suppression (see item 23.)				IF	VR4 TC1	Minimum	Less than −50dB	
	STBY : REC								
25. Speech processor adjustment	SG SW : OFF MODE : USB PROC : OFF METER : ALC Connect the AG (1500 Hz, 10mV) to the MIC input connector. STBY : SEND Adjust the MIC gain control until the meter indicates the maximum on-scale ALC reading.								
	PROC : ON				IF	VR3	Adjust until the same meter reading is obtained (max on-scale ALC).		
	STBY :REC PROC : OFF								

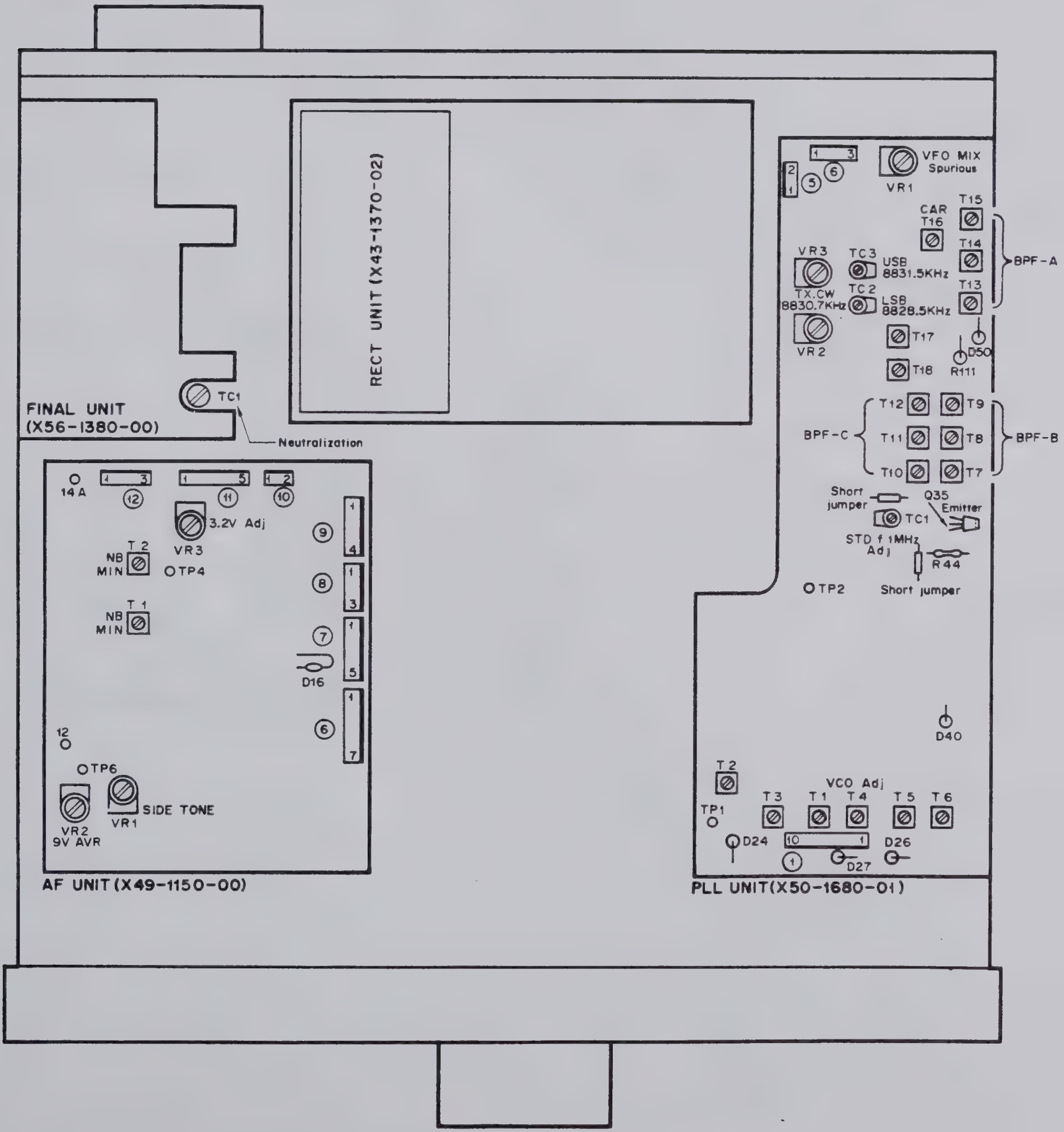
ADJUSTMENTS



Caution : **Never transmit when SSG is connected to the ANT terminal.**

Fig. 12 (12) IF AMP, (13) COIL PACK, (15) IF TRAP

▼ BOTTOM VIEW



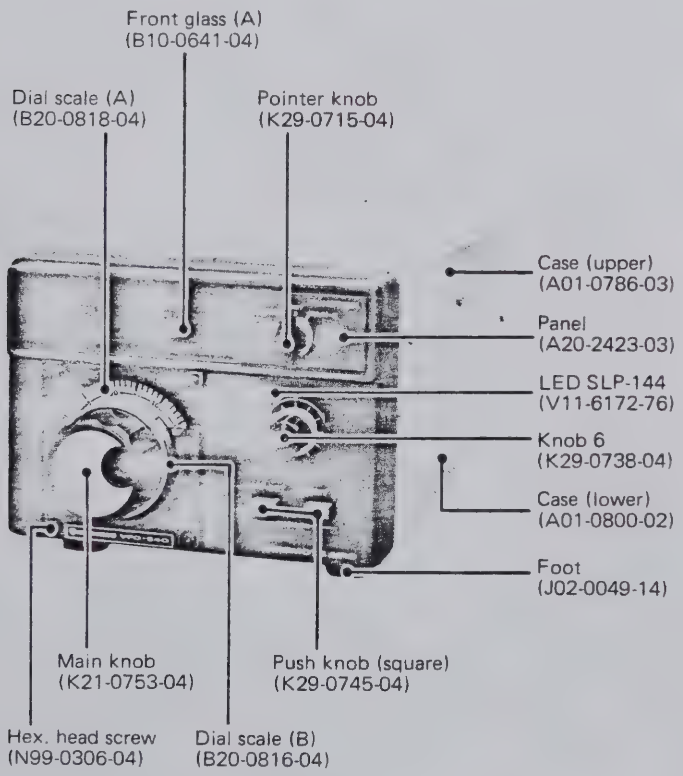
VFO-240

SPECIFICATIONS

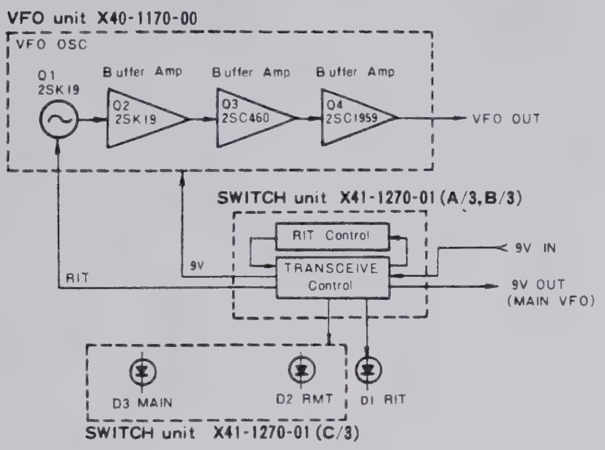
Oscillator frequency	5.50～6.00 MHz
Oscillator circuit	Clapp
Output voltage	0.2V ±1dB (across 470 ohm load)
Frequency stability	Within 100 Hz per 30 minutes after 3 minutes warm-up (at room temperature)
Solid-state complement	FET: 2 Transistor: 2 Diode: 6
Power source	From TS-530S or TS-830S
Dimensions	180 (7-1/8") W × 133 (5-1/4") H × 288 (11-5/16") D mm (inch)
Weight	2.9 kg (6.4 lbs)

* Specifications are subject to change for improvement without notice.

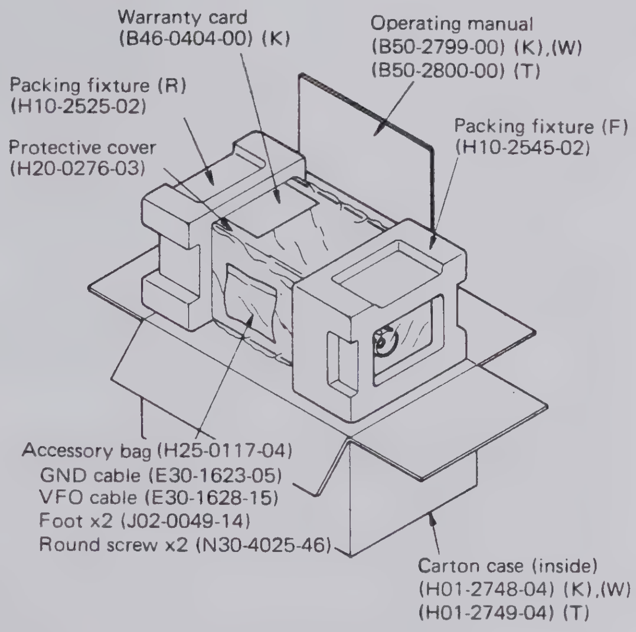
OUTSIDE VIEW



BLOCK DIAGRAM



PACKING



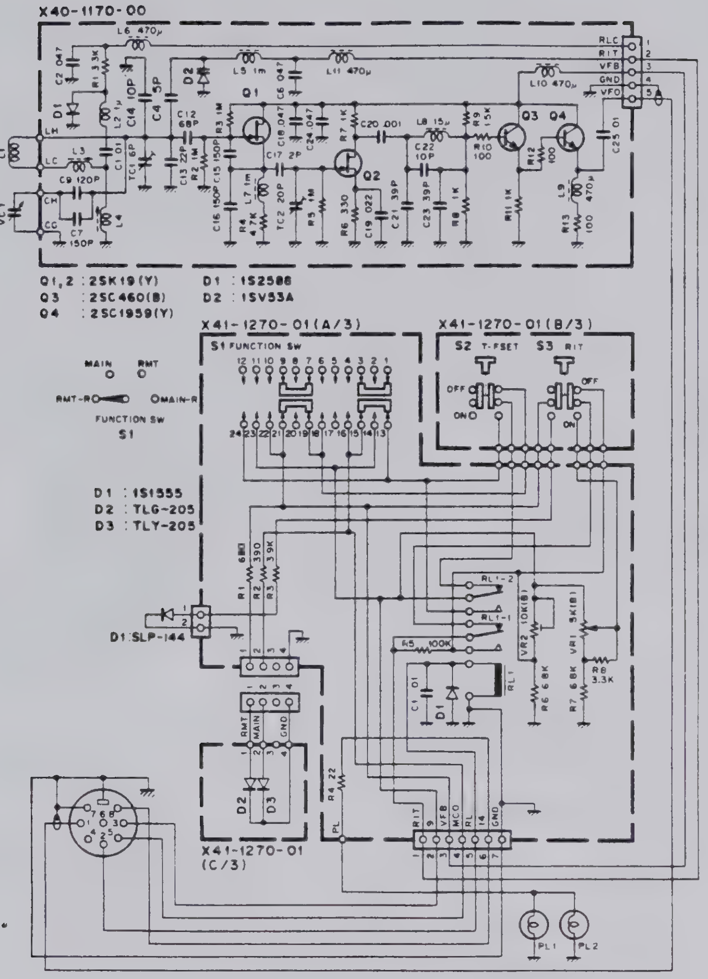
PARTS LIST

☆: New parts

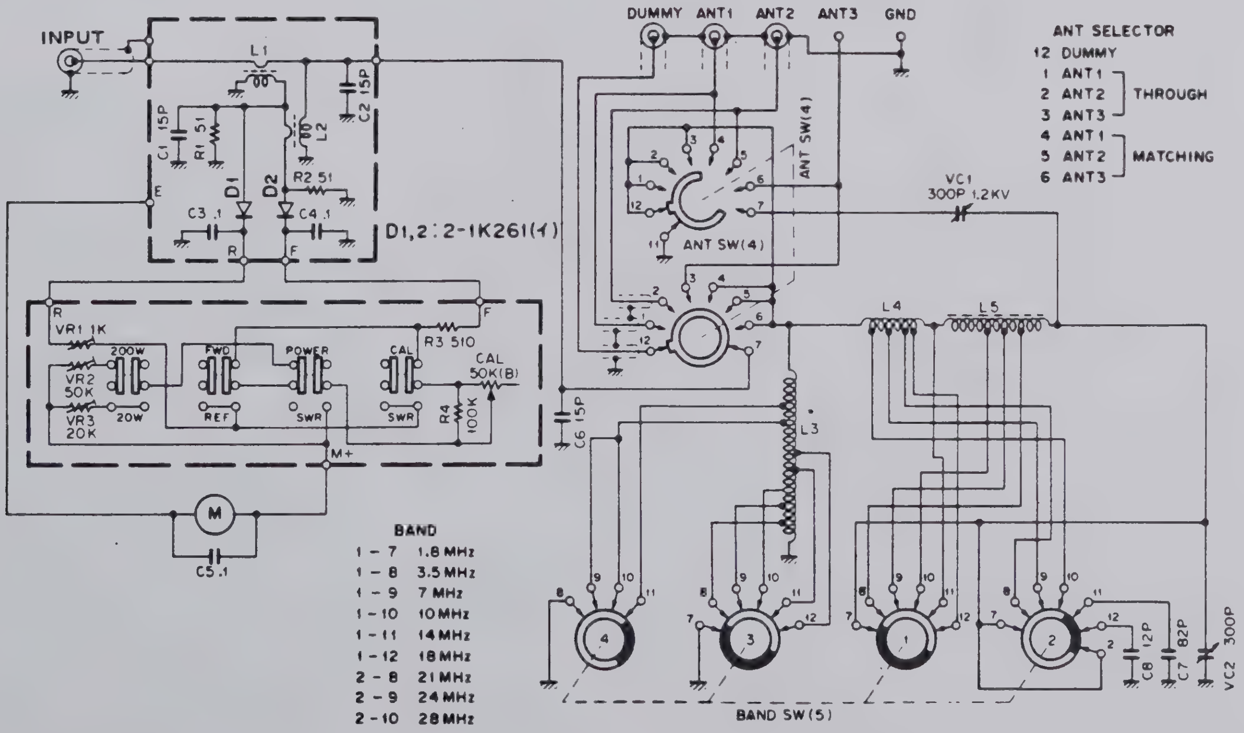
Ref. No.	Parts No.	Description		Re-marks
	VFO-240 GENERAL			
	A01-0786-03	Case (upper)		
	A01-0800-02	Case (lower)		☆
	A20-2423-03	Panel		☆
	B10-0641-04	Front glass (A)		☆
	B43-0658-04	Name plate	T	☆
	B43-0659-04	Name plate	K,W	☆
	B46-0404-00	Warranty card	K	
	B50-2799-00	Operating manual	K,W	☆
	B50-2800-00	Operating manual	T	☆

VFO-240/AT-230

VFO-240
SCHEMATIC DIAGRAM

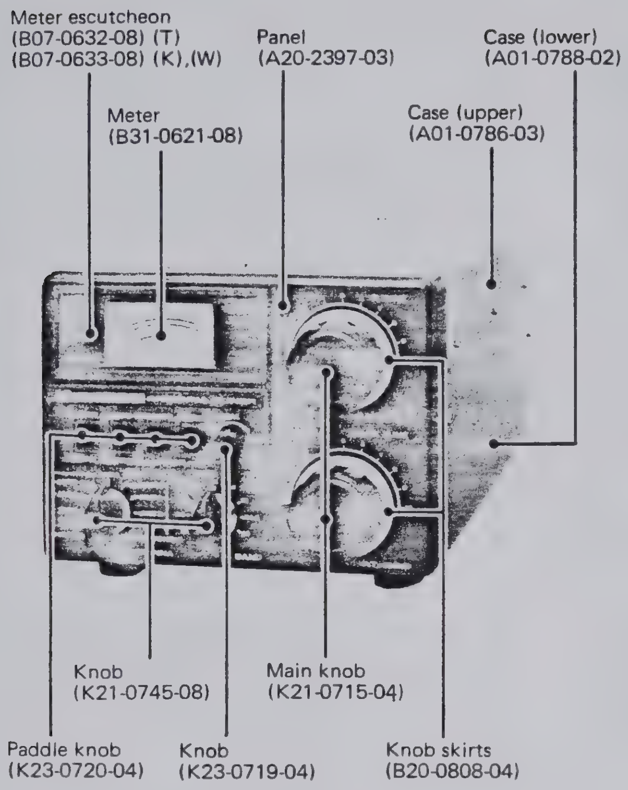


AT-230
SCHEMATIC DIAGRAM



AT-230

OUTSIDE VIEW



ADJUSTMENTS

1. INSTRUMENTS

1) Terminated Power Meter

1. Frequency range: 50 MHz or more
2. Input impedance: 50Ω
3. Power range: 20W and 200W

2) HF Transmitter or Transceiver

1) Output: 100W CW
Variable to 10W.
Example: TS-530, TS-830S

2. POWER METER ADJUSTMENT

1) Test Equipment Connection

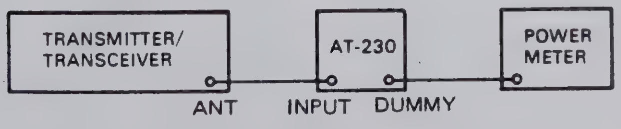


Fig. 1

2) Adjustment

1. Connect as in Fig. 1.
2. Unless otherwise specified, controls should be set as follows:

ANT SW	DUMMY
BAND SW	14
200W/20W SW	200W
FWD/REF SW	FWD
POWER/SWR SW	POWER
CAL/SWR SW	SWR

Tune up the transceiver at 14.175 MHz

3. Adjust the transceiver for 100W output at the power meter (adjusted by the carrier level control)
Adjust VR2 on the switch unit for a meter reading of 100 on the AT-230

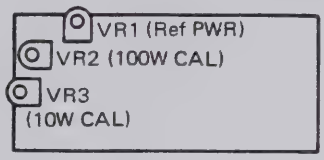


Fig. 2

4. As in step 3, lower transceiver output to 10W and adjust VR3 for a meter indication of 10 on the 20W scale

3. CALIBRATION OF REF POWER

1) Connection

As in Fig. 1.

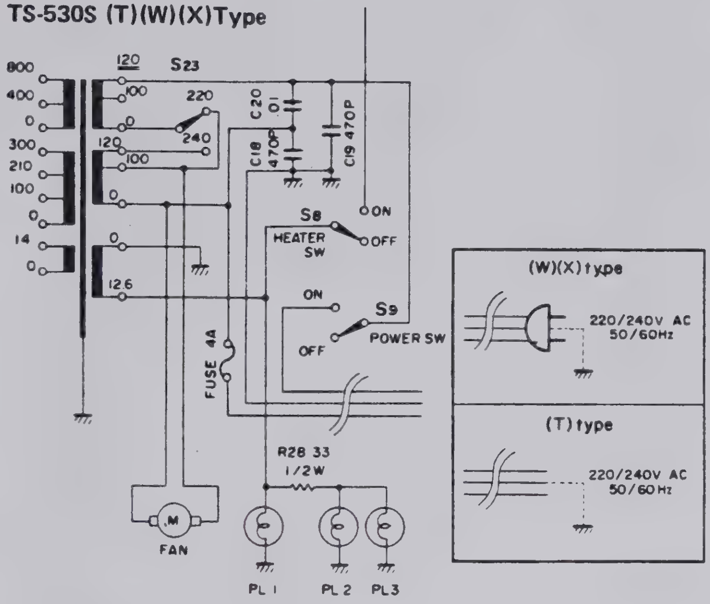
2) Adjustment

1. Set controls as described in 2.2.
Confirm 100W CW output reading
2. Unkey the transceiver and reverse the coaxial cable between the INPUT and DUMMY terminals on the AT-230. Move the FWD/REF switch to the REF position
3. Transmit and adjust VR1 for previously confirmed 100W reading

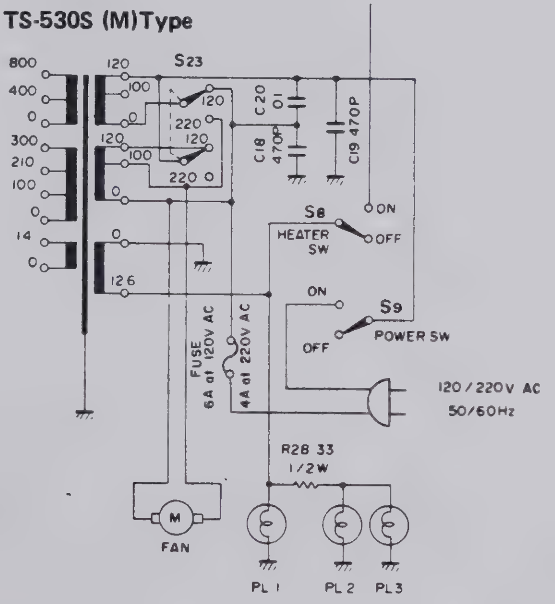
SCHEMATIC ABBREVIATION

Connector No.	Terminal name	
⑧	RLT	+9V on transmit
	RLR	+9V on receive
	−6	B −6V
⑨	ALC	ALC output from Q31
	RLT	+9V when transmit
	RLR	+9V when receive
	RL	Relay voltage
⑩	RAL	External ALC input remote socket
	VR2	Arm of TX bias control
⑪	NBV	Top of noise blanker VR
	NBS	Noise blanker SW
	9	B +9V
	PRS	Processor SW
	RF1	Top of RF gain control
⑫	NSG	Noise blanker gate signal
	RB2	Receiver bias for IF unit
	14A	14V input
	G14	14V input (ground)
	FG	Bias for control grid of 6146B
Final unit (X56-1380-00)		
	DRV	Drive input
	FG	Control grid bias
	H	Heater voltage AC12.3V
	IPM	IP meter voltage
	SG	Screen grid voltage
Rectifier unit (X43-1370-02)		
	800	B +800V
	HV	High voltage signal to METER
	300B	B +300V
	210B	B +210V
	210A	B +210V
	−C	Common B− approx. −100V
	12	Screen grid cut off voltage
	SG2	Screen grid voltage
	TUN	Screen grid voltege for TUN

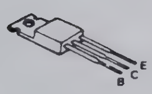
TS-530S (T)(W)(X)Type



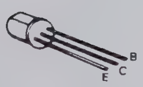
TS-530S (M)Type



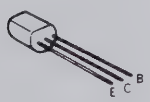
2SA473



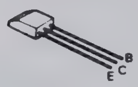
2SA562



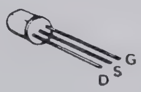
2SA778A 2SC1775
2SA1015 2SC1815
2SC945 2SC1923
2SC1515 2SC1959
2SC1675 2SC2240



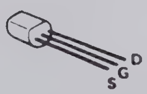
2SC460



2SK19



2SK125
2SK30A



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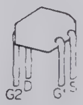

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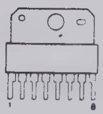

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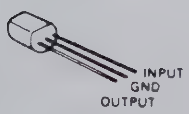

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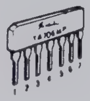
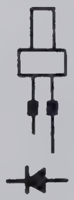


SLP-144



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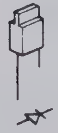
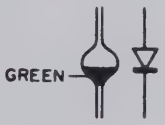
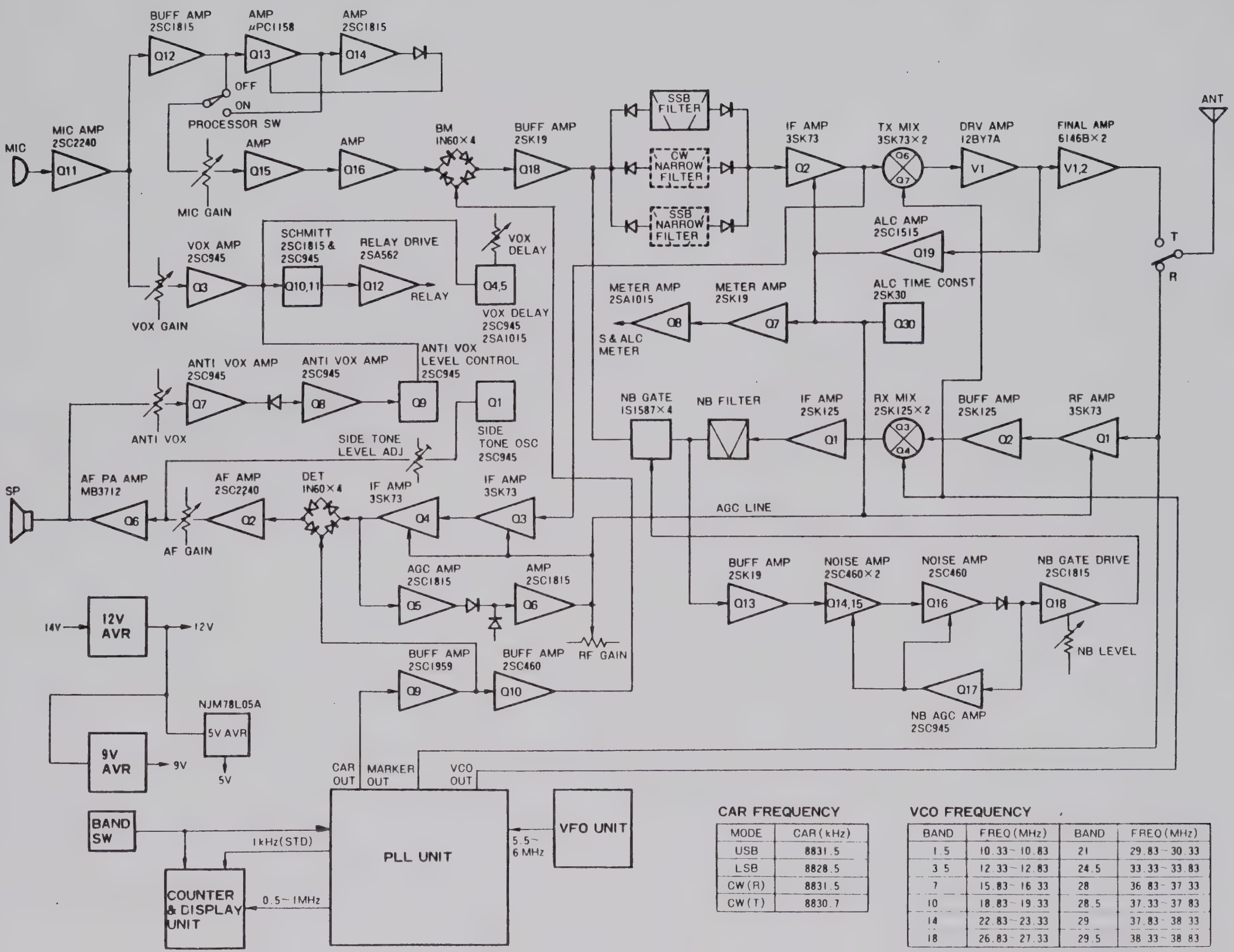


MV-13



BLOCK DIAGRAM



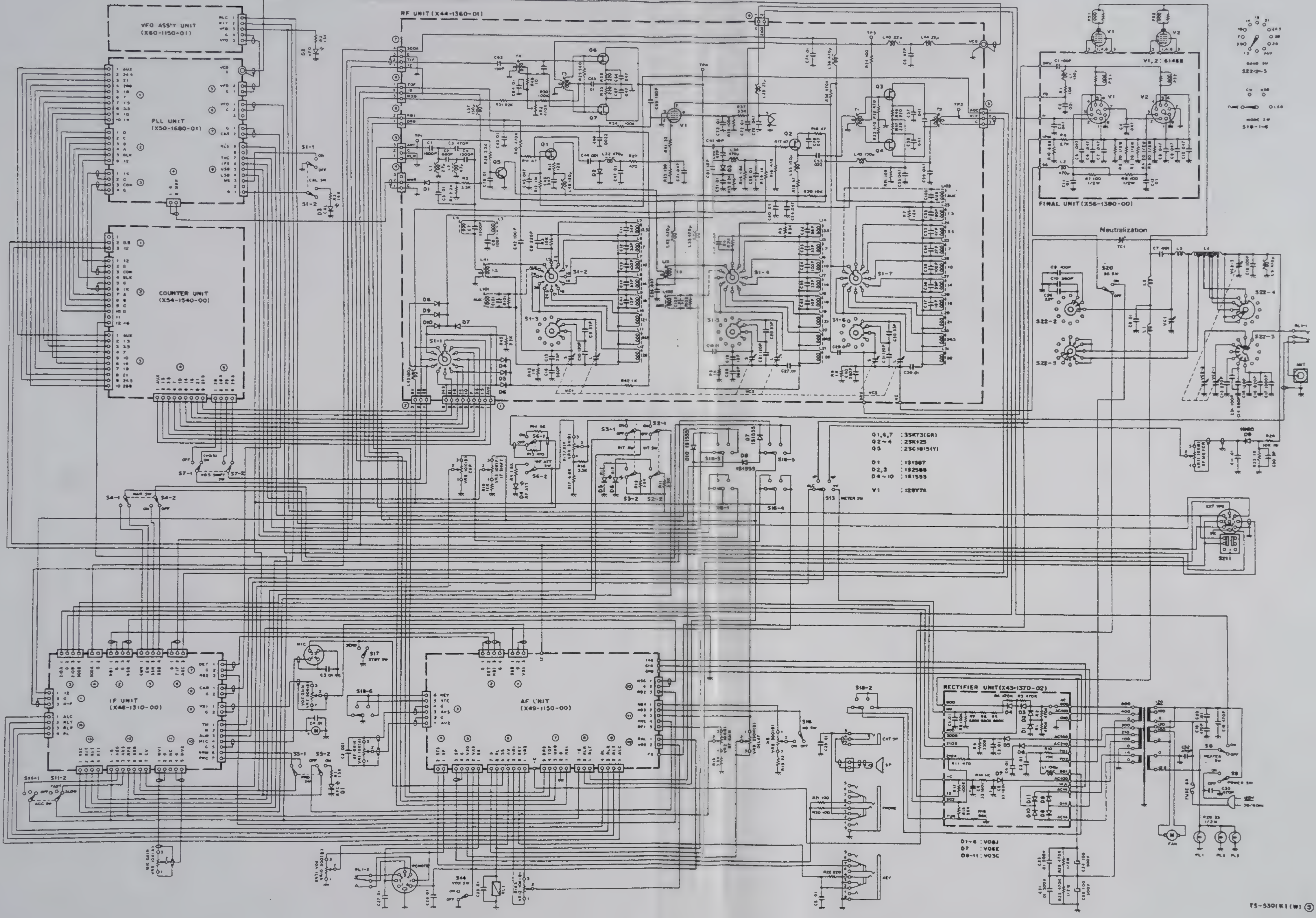
CAR FREQUENCY

MODE	CAR (kHz)
USB	8831.5
LSB	8828.5
CW (R)	8831.5
CW (T)	8830.7

VCO FREQUENCY

BAND	FREQ (MHz)	BAND	FREQ (MHz)
1.5	10.33 ~ 10.83	21	29.83 ~ 30.33
3.5	12.33 ~ 12.83	24.5	33.33 ~ 33.83
7	15.83 ~ 16.33	28	36.83 ~ 37.33
10	18.83 ~ 19.33	28.5	37.33 ~ 37.83
14	22.83 ~ 23.33	29	37.83 ~ 38.33
18	26.83 ~ 27.33	29.5	38.33 ~ 38.83

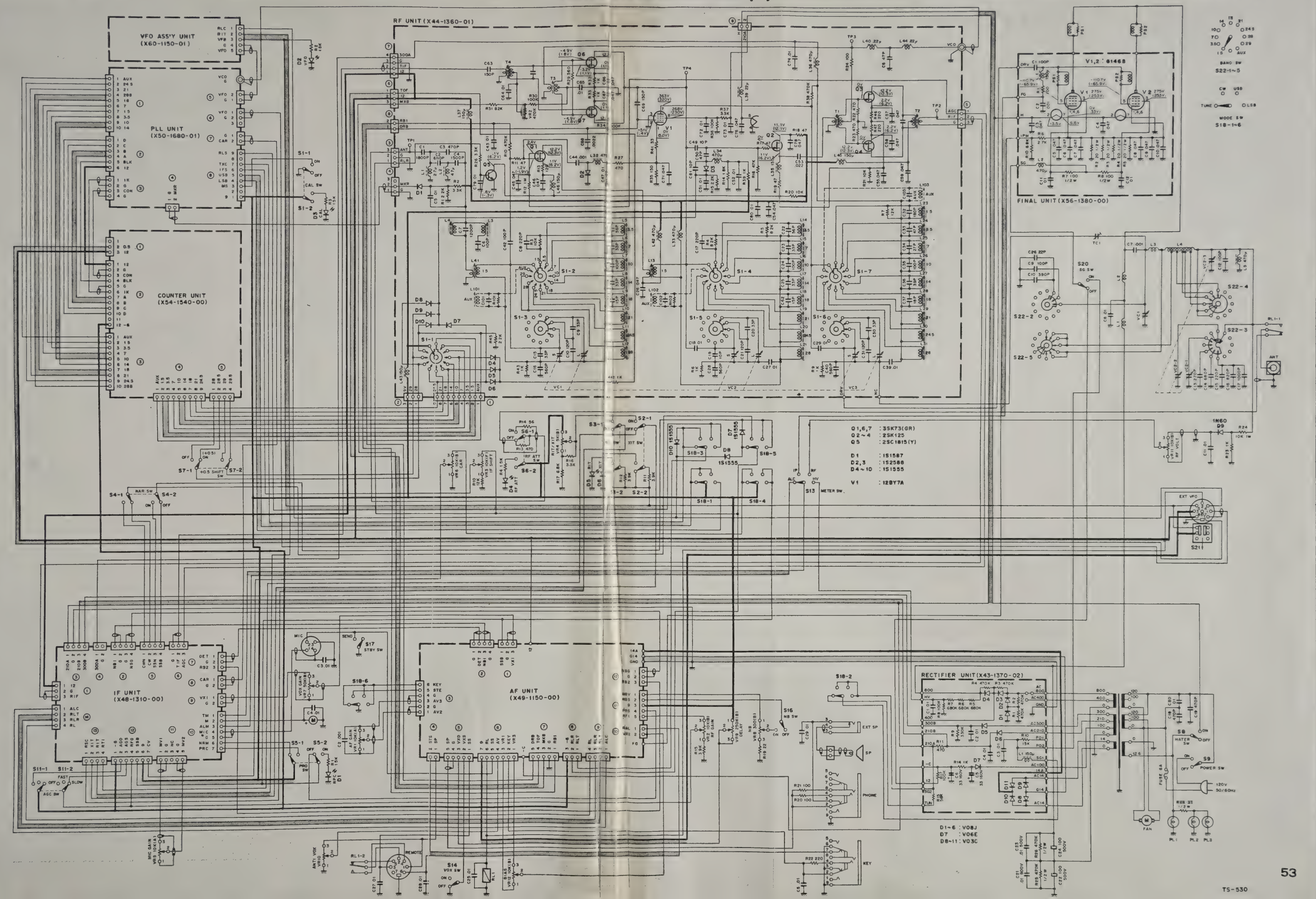
TS-530S SCHEMATIC DIAGRAM



Signal Line — — — Control Line Common DC Line

SCHEMATIC DIAGRAM (K)

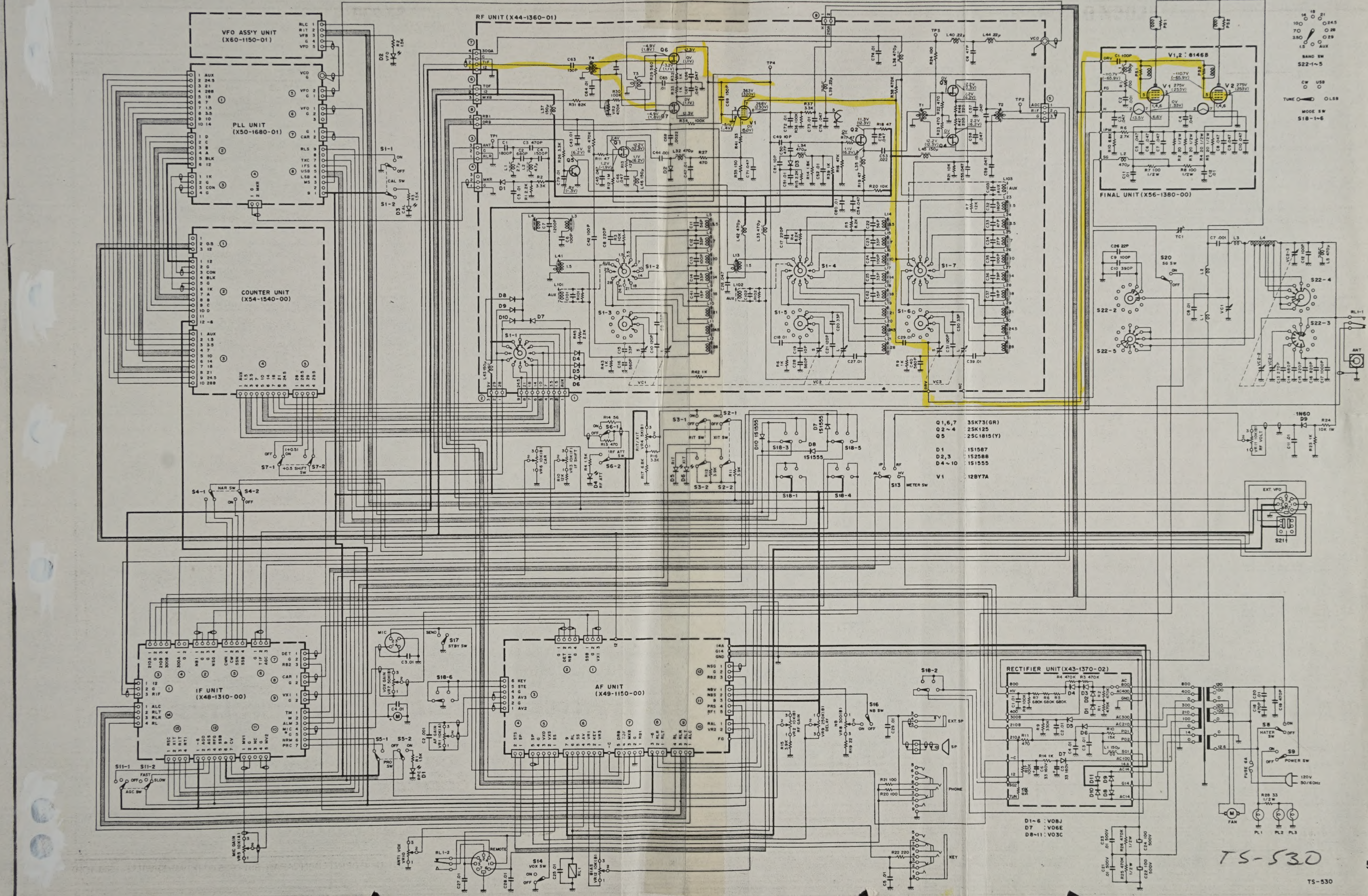
Voltage measurement conditions f=14.175MHz, RX no signal, ( ):in TX



Signal Line   Control Line   Common DC Line

SCHEMATIC DIAGRAM (K)

Voltage measurement conditions f=14.175MHz, RX no signal, ( ):in TX



TS-530

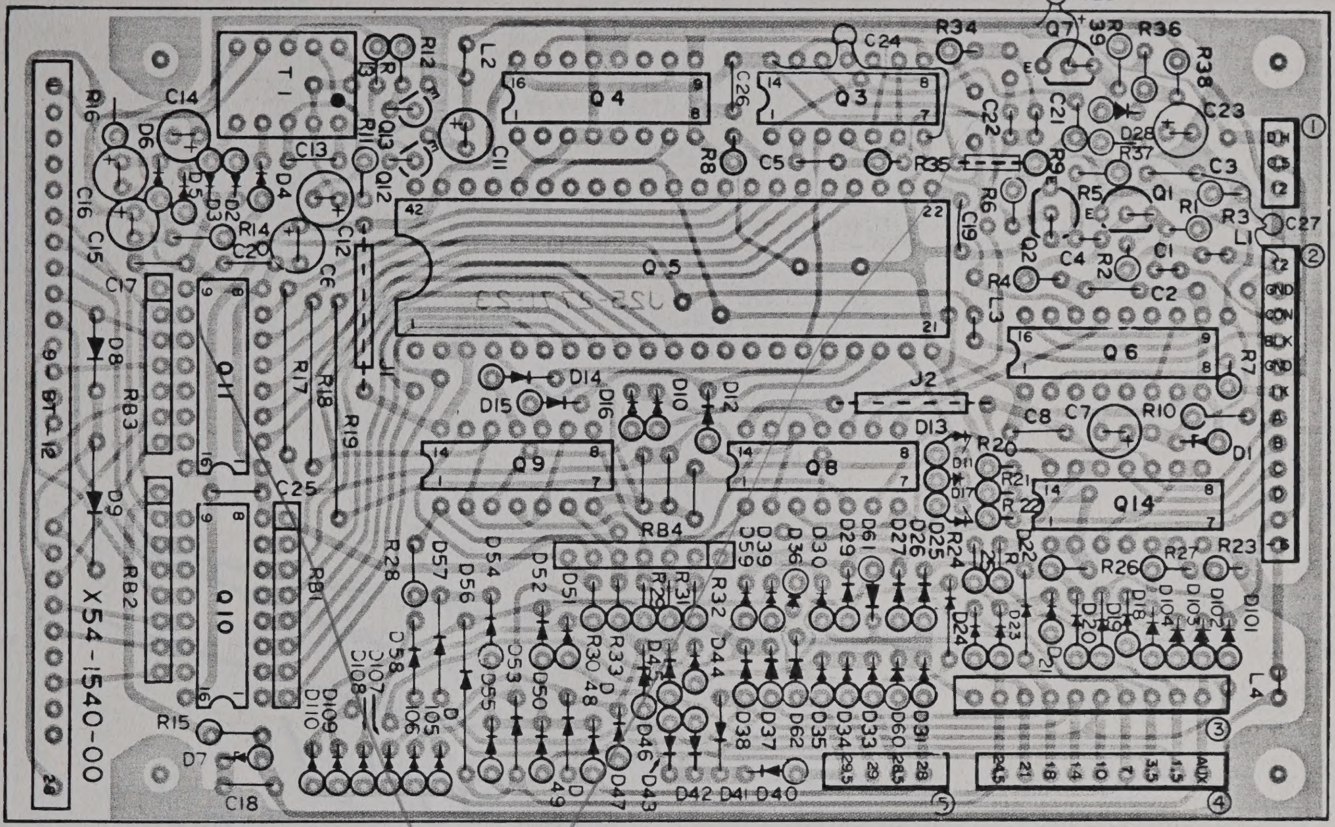
NOTE

IF

ANY Diagrams are MISSING, Check The Yaesu FT-102 File

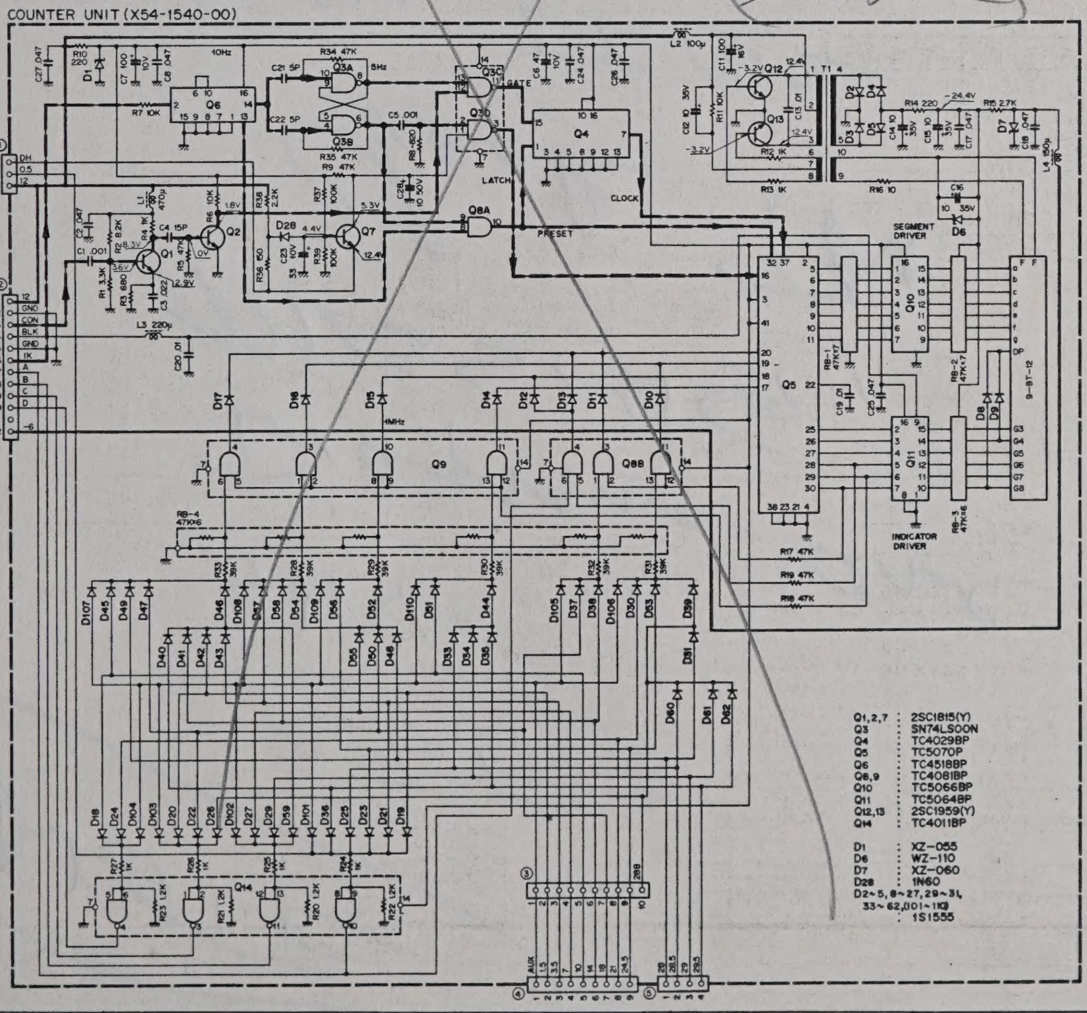
PC BOARD VIEW/CIRCUIT DIAGRAM TS-530S

▼ COUNTER UNIT (X54-1540-00) View from component side



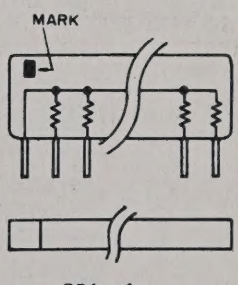
(extra)

COUNTER UNIT (X54-1540-00)



Q1,2,7 : 2SC1815(Y)
Q3 : SN74LS00N
Q4 : TC4029BP
Q5 : TC5070P
Q6 : TC4518BP
Q8,9 : TC4081BP
Q10 : TC5066BP
Q11 : TC5064BP
Q12,13 : 2SC1959(Y)
Q14 : TC4011BP

D1 : XZ-055
D6 : WZ-110
D7 : XZ-060
D28 : 1N60
D2~5, 8~27, 29~31,
33~62, 101~110
: 1S1555



RB1 ~ 4

2SC1815
2SC1959